

Electrical Contracting

INDUSTRIAL CONSTRUCTION



A P R I L • 1 9 4 2

A Ford glass plant, re-equipped for producing military truck parts, is typical of the conversion job in Detroit's great industrial plants. And everywhere electrical systems are being adapted to new war production lines. See "Conversion", page 17.

INDUSTRIAL ELECTRIFICATION SECTION
PAGES 57 — 72

What Makes THIS PROTECTIVE FENCE LIGHTING So Good?



Its Exact Control of **VISIBILITY and GLARE** *with* *Form 79VR Luminaires*

GOOD protective fence lighting should provide these three advantages:

- An adequate volume of light
- Sufficient overlap to prevent a dark area if one lamp in the circuit should fail
- Freedom from objectionable glare

That's exactly what you get when you use G-E Form 79VR luminaires. Two diametric beams—with more candlepower at the high angles—"reach out" farther and interfere less with visibility than any conventional two-way distribution. The universal-bracket hood suspends the luminaire vertically to light a 40-foot band along the fence, or permits tilting to light an approach area up to several hundred feet wide. Tilt permits the patrol area back of the pole line to be in comparative darkness; the guard, screened from the intruder by the direct beam

of the luminaire, has a clear view across the shadowless area.

Look over the situation in your territory. You'll find an increasing demand for better-than-ordinary protective lighting. Why not let a G-E lighting specialist show you how to get it on your next job? Just call or write our nearest office. *General Electric, Schenectady, N. Y.*

A. Form 79VR luminaires spaced 150 feet apart and 12 feet back of the fence line put a uniform level of illumination on every foot of the boundary.

B. Guards have a clear view down the fence line. There are no dark shadows to offer concealment.

C. Day view shows how luminaires are tipped to illuminate a wider area.



General Electric and its employees are proud of the Navy award of Excellence made to its Erie works for the manufacture of naval ordnance.

GENERAL  ELECTRIC

451-55-3200

INDUSTRY LIKES

THIS GOOD SOUND DESIGN!



SKETCHED above is the switch block from a Murray Single Throw, Fusible, Type D, Safety Switch. In the circle, is its outstanding feature—the double break blade and arc quenching chamber.

Each blade is provided with a double break—the arc is broken into two parts. The burning action is greatly reduced by this feature. Whatever arc is formed at each of the two breaks is drawn into a narrow slot in the mounting base where it is lengthened-out and cooled—the two effects co-acting to quench the arc almost instantly.

This arc-quenching construction coupled with those Murray Switch characteristics as, ample wiring room, properly placed knockouts, good-looking cabinets, assure the contractor the satisfaction that comes from a first-class installation. Metropolitan Device Corporation, Brooklyn, N. Y.

ARC-QUENCHING CON-
STRUCTION IN 2, 3 and
4 Pole 30, 60 and 100 Amp.
SAFETY SWITCHES



ELECTRICAL CONTRACTING, Published monthly, price 25 cents a copy, Vol. 41, No. 4. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription Rates—U. S. A., and Latin American Republics, \$2.00 a year, \$3.00 for two years, \$4.00 for three years. Canada \$2.50 a year, \$4.00 for two years, \$5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries \$3.00 a year; \$6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1942, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

● YEARS AHEAD IN DESIGN.

Prepared in peace - ready for war

Wars are won by getting there "fu'stest with the mostest"—whether it's men, material or the motors that back them up.

That's why a proved weapon—or motor—on the production line is worth many in the drafting room or proving laboratory. And that's why Westinghouse CS Motors, designed around fundamental features proved and perfected years ahead of war needs, are able to meet today's emergency demands.

CS Motor features are the outcome of Westinghouse

experience in induction motor design that goes back to the first industrial use of alternating current. Hundreds of thousands of CS Motors in use for five, ten, twenty years and even longer, have proved their soundness.

Improved and refined but not basically changed, they, today, are universally accepted by industry. And today they enable Westinghouse to meet the enormously increased demands of industry at war. Check your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-21230

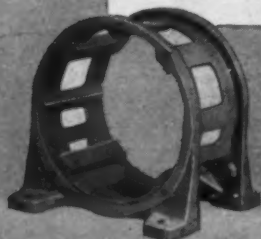
Westinghouse



cs motors

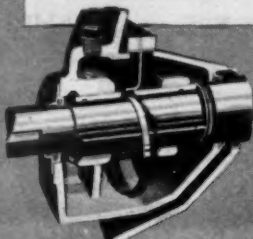
TESTED by Time... PROVED by Experience

YEARS AHEAD WITH ONE-PIECE FRAMES



RIGID ONE-PIECE FRAMES were introduced by Westinghouse in 1928 to protect against twisting strains and vibration. An important feature then—even more important today.

YEARS AHEAD WITH SEALED-SLEEVE BEARINGS



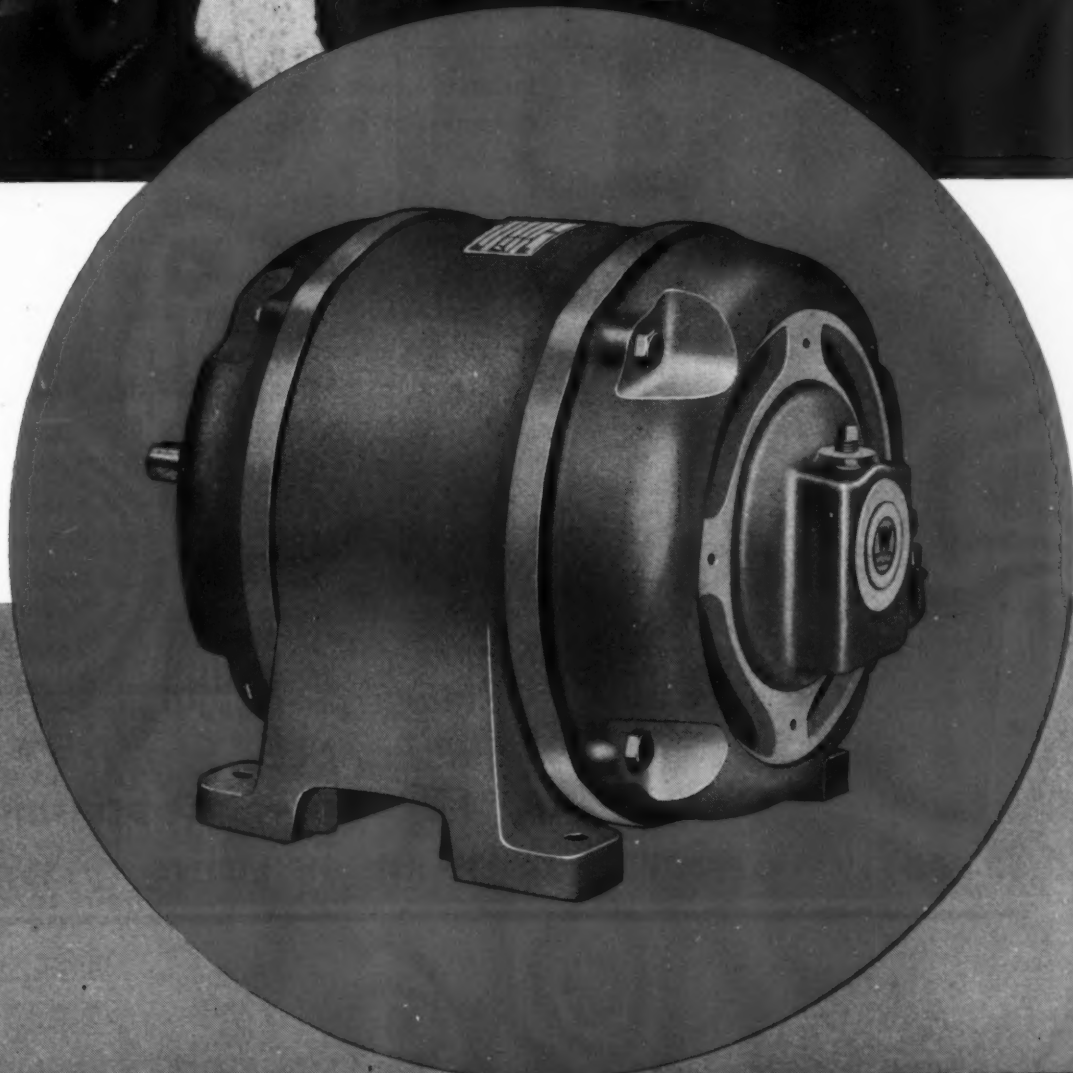
SEALED-SLEEVE BEARINGS, a long-life design feature introduced by Westinghouse in 1925, seal oil in—dust and dirt out.

YEARS AHEAD WITH IMPROVED INSULATION



Since 1930, TUFFERNELL insulation has given extra dielectric strength at vulnerable spots. Westinghouse radio-frequency test checks every turn in windings.

...PROVED AND APPROVED BY PERFORMANCE



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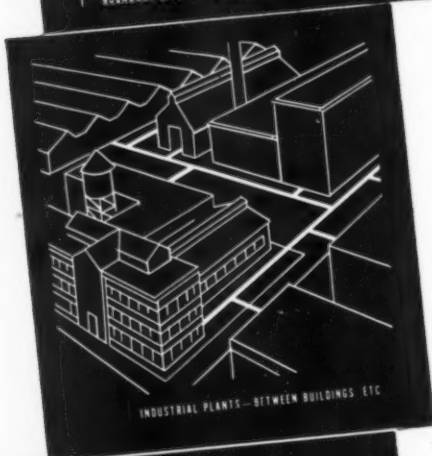
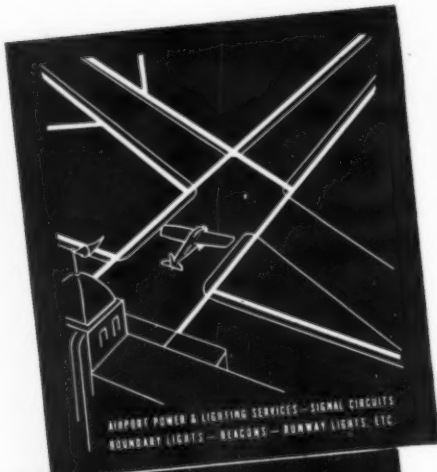


For Speed... For Safety... For extra Profit



GO UNDERGROUND

the **NOCRETE** way



Speedily installed because it requires no concrete encasement, Nocrete underground conduit is easy to handle and economical to use. It is ideal for use in airport or industrial applications, for example, where minimum disruption of plant traffic is essential. In the event of cable change, Nocrete provides an underground raceway through which cables can be easily pulled in or out.

Despite its light weight, Nocrete provides the mechanical strength and exceptional deflection value so vital for airfield service, where ground stresses and settlement are problems. Its use has approval of the Civil Aeronautics Authority.

Remember, too, the valuable time that can be saved by ordering Nocrete and other Orangeburg fibre conduit "via GRAYBAR". Don't overlook the fact that GRAYBAR is headquarters for "everything electrical". Subject to priority regulations, a single order can cover all your requirements under ground and above ground — all the things that must "go together" in service for a fully satisfactory job. Just call your local GRAYBAR Representative.

GraybaR

in over 80 principal cities

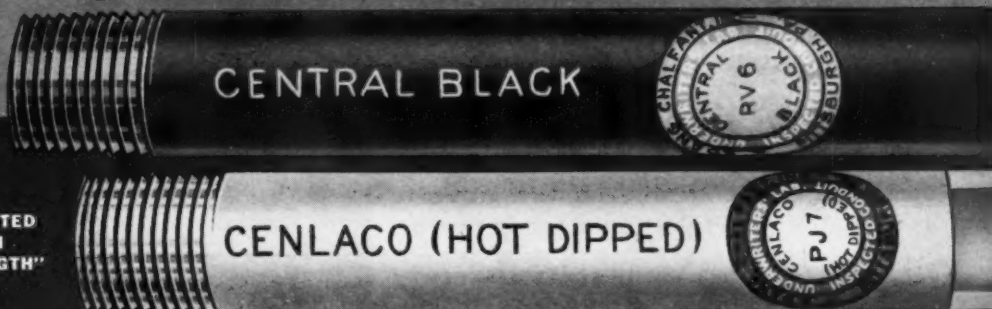
EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

AFTER THE BLACK-OUT

WILL VITAL CIRCUITS BE O.K.?

Like armoring . . . the rigid steel body of Central Conduit surrounds your vital electric lines with protection . . . a strong defense against shock and vibration, shear, twisting and the attacks of moisture and fumes. All circuits are vital today . . . be sure they are constructed strongly!

Guard with **CENTRAL** RIGID STEEL CONDUIT



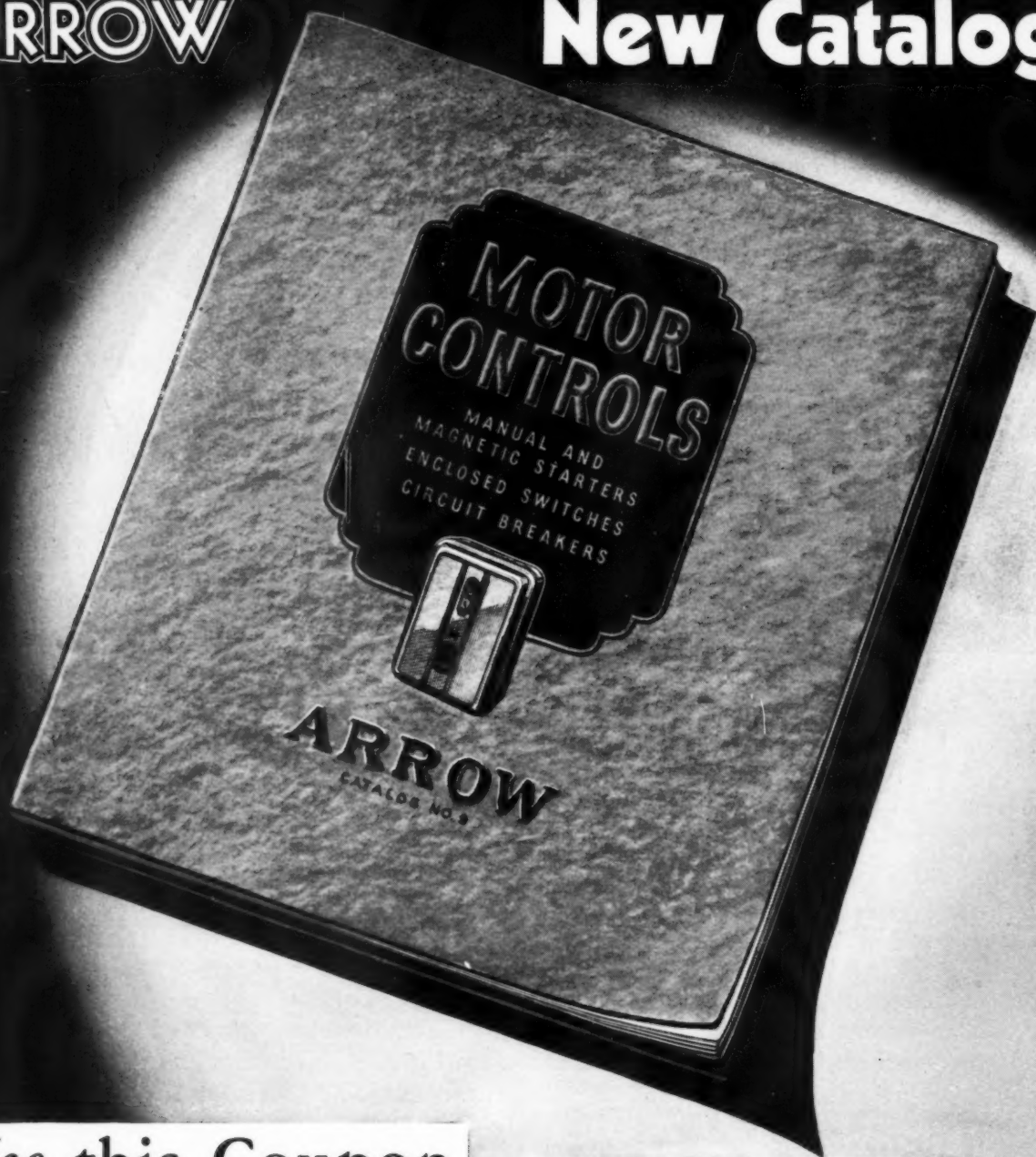
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STRENGTH
IN EVERY LENGTH"

For Sale By
SPANG CHALFANT, INC.
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ARROW

New Catalog



Use this Coupon

to connect with a *full range* of Motor Controls for all jobs up to 50 H. P. Across-the-Line type Relays, Solenoid Starters, Magnetic Controls... Manual Starters, Safety Switches, Service Equipment, Master Devices, Contactors, Circuit Breakers... Carefully built, dependable mechanisms, engineered with a background of 51 years' experience in designing and developing electrical controls. Modern attractive designs, easily accessible parts, handy to wire.

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11

ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

Erase these Questions

FAST

When Planning
a Job



Call on this Helpful Service of the **HAZARD ENGINEERING DEPARTMENT**

Here's a helpful hand offered by Hazard to make it easier for you to plan wiring jobs these days. Our experienced engineers are kept informed with complete, last minute news on the what, where and when of the supply of wires. Add this to the training and experience of Hazard Engineers and you can readily see how these men will help you solve many problems today.

Let's take as an example a new wiring job. Usually there are several alternative methods for installing an electrical service. Hazard Engineers are in position to tell you immediately which method would be wisest from the standpoint of availability of wires and where you can get them quickest. With the wiring picture changing so

rapidly, this information saves you time, expense and can help you get more wiring jobs.

This Hazard service is complete . . . reliable . . . and yours without obligation. As always the first purpose of the Hazard Engineering Department is to help you, and there was never a better time to make use of it than right now.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE COMPANY

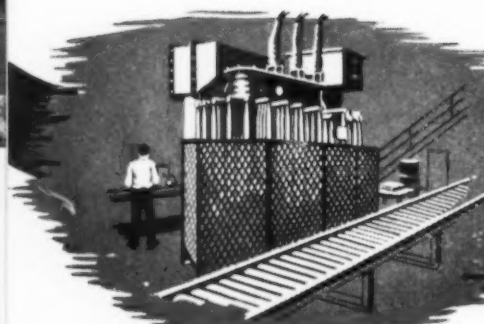
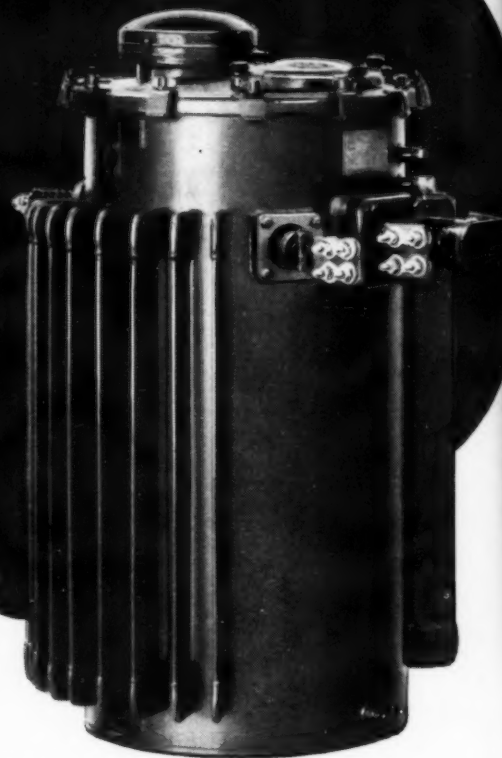
Works: Wilkes-Barre, Pennsylvania

Offices in Principal Cities



HAZARD
INSULATED WIRES & CABLES

PYRANOL TRANSFORMERS



1 Economical, speedy installation of transformers indoors was made possible by the introduction of Pyranol® ten years ago. Today, hundreds of utilities, industrial plants, public buildings, and naval and military establishments use Pyranol transformers to supply power for vital production and other war activities.

*General Electric's nonflammable insulating and cooling liquid

2 You can't burn Pyranol! No Pyranol transformer has ever burned, or contributed to a fire! This record covers installations of more than 8,000 transformers, ranging in size from 1½ to 12,000 kva, and totaling more than 2,000,000 kva. It fully justifies the recognition given Pyranol transformers by the National Electrical Code.

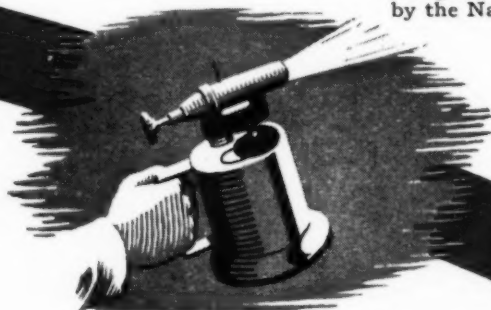
RIGHT now, safety and reliability of power supply are of paramount importance. Investigate the benefits of Pyranol transformers—especially indoor installations—when you need added transformer capacity. Compared with conventional outdoor installations, you'll make major savings—in time, construction materials, and in copper. Thousands in use prove it. Ask your G-E representative for complete information. Or, write for Bulletin GEA-2048C. *General Electric, Schenectady, N. Y.*

GENERAL  ELECTRIC

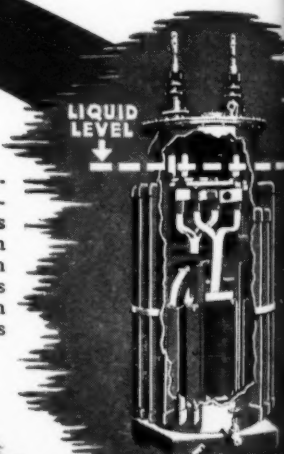
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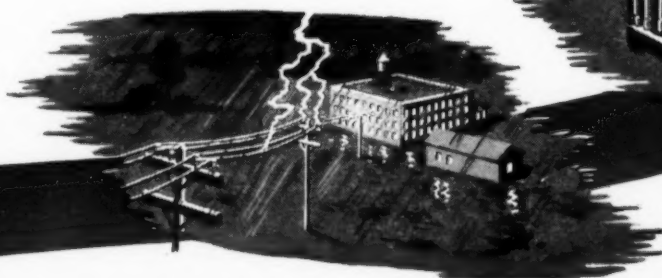
General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.



3 The reliability of Pyranol transformers is appreciated by users. It is based on design principles that have made liquid-filled transformers the most nearly trouble-free electric apparatus in service today. Heat-storage capacity—inherent in liquid-filled transformers—makes Pyranol units ideal for sustained emergency overloads. Immersion of the transformer interior in Pyranol prevents drying and cracking of the winding insulation.



LIQUID LEVEL



5 Little, if any, maintenance. The sturdy tank, all-welded by electric process, protects vital parts of the transformer against sabotage and the entrance of moisture, dirt, dust. Pyranol is nonoxidizing, nonsludging. Years of use do not impair its insulating properties.

4 High dielectric strength both at normal frequency and impulse gives Pyranol transformers great ability to withstand voltage surges that originate from switching operations or lightning.



You Double Your Installation Crew *Without Adding a Man* When You Specify Combination Starters

USERS REPORT INSTALLATION TIME CUT 50%

A survey of users shows that they mount G-E combination starters in 50 per cent less time, and wire them in 40 per cent less time.

Here's why . . .

1. You can avoid one complete mounting job on each installation—combination starters combine both a motor switch and a magnetic starter in one unit.

2. Combination starters come to you already wired—only wiring necessary is the connection of power and motor leads.

Don't waste time installing two devices where one can do the job. Call your local office and find out all about these starters. General Electric, Schenectady, N. Y.



Combination Starter



Manual Circuit Switch



Magnetic Starter

Regularly furnished
for use with
motors up to 200 hp.



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

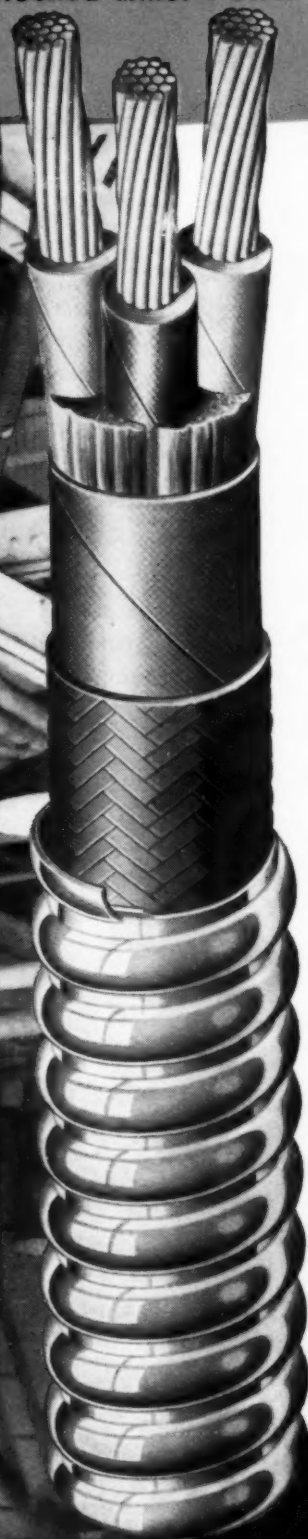
GENERAL ELECTRIC



This

G-E Cable

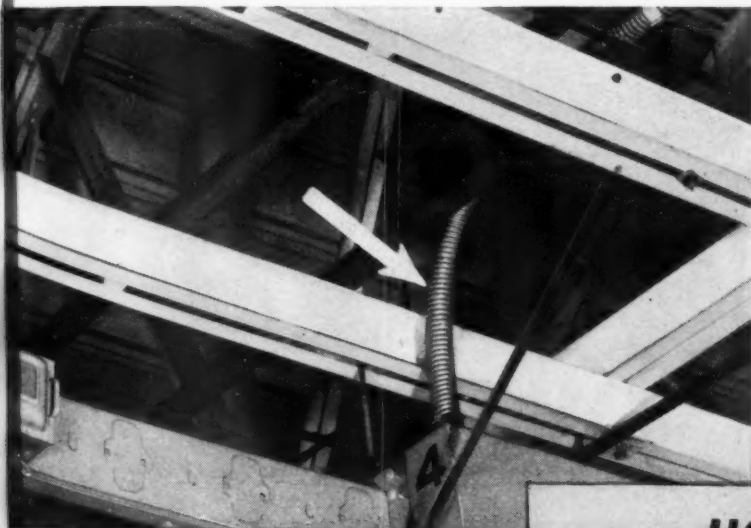
No. 1799 Varnished-cambric
Interlocked-armor Power Cable



FEEDER-RUNS IN A SHELL-LOADING PLANT

Run of eight, 3-conductor, 600-volt, v-c interlocked-armor cables. See the simplicity of suspension and note that the cable can be trained easily. No. 1799 v-c has been submitted for National Electrical Code approval for voltages up to and including 5000—and is now listed by the Underwriters' Laboratories for 601 to 5000 volts.

Saves Vital Materials and Goes Up Fast



FOR REDISTRIBUTION. Here v-c interlocked-armor (600-volt) cable feeds into Trumbull Flex-A-Power bus for redistribution to the machines. This is a 500,000-cir mil cable.



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

SPEAKING OF SAVINGS!

This cable is ideal for use with G-E unit substations for load-center distribution—a practical means of bringing the economies of high-voltage power indoors, close to the point of use, where it is redistributed at lower voltage. Ask for publication GEA-3758.

IF ever there was a cable of the hour this is it! You can install it in less time than previous combinations. It saves tons of vital materials; and electrically it's as good as, or better than, the combinations previously used for power runs up to 15,000 volts.

Are you planning new or additional construction for war production? If so, we'd like to help you make advantageous use of v-c interlocked-armor cable in your plant layout, and figure what the estimated savings will be. Consult our office in your locality, or write to General Electric, Schenectady, N. Y.

HOW MUCH DOES IT SAVE?

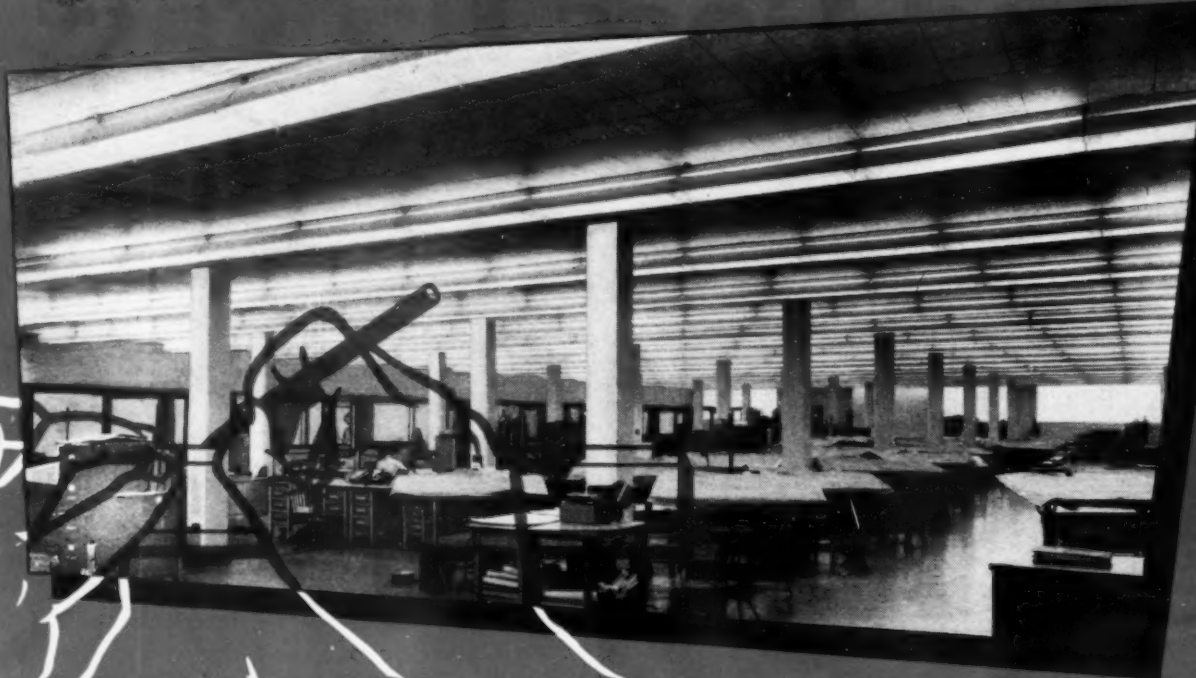
Calculations based upon requirements for a 3000-kva load—floor space, 450 by 700 ft

DISTRIBUTION METHOD	POUNDS OF MATERIALS			
	COPPER	STEEL	OTHER	TOTALS
Conventional Radial— with Rubber Cable and Conduit	18,500	43,500	4600 (mostly rubber insulation)	66,600
Conventional Radial— with V-C INTERLOCKED- ARMOR CABLE	13,600	5,070	4420 (rubber negligible)	23,090
SAVINGS	4,900	38,430	180	43,510
Load Center— with Rubber Cable and Conduit	4,560	16,150	4190 (947 lb rubber)	24,900
Load Center— with V-C INTERLOCKED- ARMOR CABLE	3,420	2,015	4140 (rubber negligible)	9,575
SAVINGS	1,140	14,135	50	15,325

GENERAL ELECTRIC

501-12-1200

PRODUCTION SPEED
STARTS IN THE DRAFTING ROOM—
AND DRAFTING EFFICIENCY
STARTS WITH GOOD VISIBILITY!



**HERE'S HOW THE PROBLEM WAS SOLVED
 BY ONE TYPICAL USER OF . . .**

Guth FLUORESCENT LIGHTING

306 GUTH FUTURLITERS brilliantly light the way to faster, more efficient production for Uncle Sam in this modern Drafting Room working exclusively on Defense Orders. Right here, where designs are made and plans are laid, is the starting place for the Drive to Victory. No time for groping—the men must be able to see fast, easy, clearly!

In this 70' x 150' room, GUTH Futurliters with Egg

Crate Louvres, are now delivering 52 to 54 foot-candles of Working Light, at the end of a period of several months operation.

You will be rendering a conscientious, patriotic service by recommending GUTH Fluorescent for Offices and Drafting Rooms busy on Government orders in your territory. Let our Engineering Staff help you work out specifications for maximum efficiency.



THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

Electrical Contracting

With which is consolidated The Electragist and Electrical Record . . . ESTABLISHED 1901

CONTENTS

APRIL, 1942

W. T. STUART Managing Editor
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A PRACTICAL PAPER for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction and maintenance.



15—The Lesson is Clear

17—Conversion

—Industrial conversion is creating new wiring problems and new methods to solve them. Here is how Detroit is changing its auto assembly lines for new war production.

20—Wiring A Laboratory—By G. F. Ehrlich

—How a modern laboratory was wired at Kansas State College, to give the maximum in convenience, flexibility and safety.

22—Practical Fluorescent Servicing

—By Harris J. Reinhardt

—How to shoot trouble on fluorescent lighting installations. Tests and checks for servicing lamps, starters and ballasts.

24—Cutting Welder Maintenance—By George Palm

—Here's how one large plant reduced its electric welder maintenance to a minimum to speed the fabrication of war materiel.

26—NISA Looks Ahead—By Leonce Bonnetcaze, Jr.

—A statement by the president of the National Industrial Service Association telling how the organization is geared to problems of war.

28—Editorials and Back Talk

57—Industrial Electrification—A Feature Section

—Electrical Aids to Plant Conversion.

DEPARTMENTS

32—Wiring Methods

38—Motor Shops

44—Modern Lighting

68—Reader's Quiz

74—Estimating

82—Questions on the Code

88—Equipment News

98—New Literature

102—In the News

111—Priorities

125—Advertisers' Index

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ON THE ALERT!

There is no unguarded moment in Anaconda's "control" research; the war program and our industry can thus count on the uniform dependability in every Anaconda wire and cable.

KLEEN-MINDED technicians peer intently into metallographic microscopes, day in and day out, watching, watching to see that flawless metals go into every Anaconda wire and cable that is delivered to war-vital work.

Unceasing control like this has earned its "keep". For, throughout industry and now in the army and the navy, users have learned they can lean heavily on the dependability of wires and cables bearing the Anaconda trade-mark. And that isn't all.

They have recognized Anaconda research as a source for many product improvements and for many completely new developments . . . such as Type CB* construction that outlasts ordinary shielded paper-lead cable three to one. This research is a boon to our war effort . . . it will be equally valuable to industry with the return of peace.

*CB—Trade-mark Reg. U. S. Pat. Off. 42242



This familiar trade-mark symbolizes the best efforts of modern research and production.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

ANACONDA WIRE & CABLE COMPANY

Subsidiary of Anaconda Copper Mining Company

* GENERAL OFFICES: 25 Broadway, New York City • CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

Electrical Contracting

THE LESSON IS CLEAR

Charred and blistered, at an awkward angle, the once proud and graceful Normandie rests in the river mud, a tragic monument to carelessness. Highly combustible material and an acetylene torch in the hands of a workman proved as deadly as a dive bomber. When and how the majestic craft can be restored to duty is a problem for the Navy. But for us the lesson is clear.

Like most of the construction jobs we see today, the work of reconditioning the Normandie was carefully guarded. A stranger would encounter searching questions and a rigorous routine if he had business at the pier. Cameras were forbidden. Curious and casual visitors were barred. For caution and care against the ever present threat of sabotage is essential in war.

In the same way, experts in sabotage prevention and counter espionage are guarding our industrial, military and naval construction. But fire hazards from risky design, slipshod workmanship or plain carelessness are beyond the control of the FBI. Guarding against industrial dangers is a task for experts, too. We are experts, each of us in our own job.

Thank God the Normandie fire was not tagged "of electrical origin." This particular tragedy is not our responsibility. But when we stop to consider the potential destruction bound up in our wiring systems we can take little comfort. At utilization voltages, the quantities of industrial power that could run amuck would make a gas torch seem like a child's toy.

Of course we have tamed this Genii of ours. We

have tamed it so well that it is the familiar hand-servant of every home, office and factory. The automatic operation of protective devices is all we ever see of its destructive power. But most important of all we tamed it by strict design and by progressive improvement.

The manufacturers of electrical equipment by competent engineering standards and laboratory labelling through the years have built adequate safety margins. Wiring has been installed under a remarkably exacting set of rules, unique in the building industry. The technical skill and craftsmanship in wiring systems has always far exceeded other crafts. And each of us, in some way, is responsible to his industry in maintaining this unique record.

Under the pressure of these times there is a sore temptation to skip the details, to relax the safety margins or to risk short cuts. Supervisory staffs are burdened with large and unfamiliar crews. Drafting boards are piled with work yet to be done. Engineers are harried and overworked. But it is just such circumstances that demand extra vigilance. Materials must be more carefully chosen. Workmanship must be a little more skillful. Safety margins must be a trifle wider. Because our mistakes may have to be paid for in the lives of our brothers in battle.

Let's check our jobs today, and every day from now on. From engineer to apprentice, each has his gate to guard. A borderline design or a poorly taped joint might be the torch to an industrial disaster. We cannot risk fires "of electrical origin" in industry today.

A P R I L 1 9 4 2

LEAVE IT TO THE MISSUS: By Gene



THE TIRE RATIONING BOARD JUST CALLED UP AND SAID THEY CAN'T SEE TO DO A THING TILL THEY GET THOSE LIGHTING FIXTURES YOU PROMISED TO DELIVER.

FOR ALL-AROUND HELP ON LIGHTING JOBS BETTER GET IN TOUCH WITH **GraybaR**

You can cut out a great deal of confusion and delay when you call on GRAYBAR to work with you on lighting jobs.

- GRAYBAR offices are familiar with the priority requirements affecting lighting equipment. They can steer you right in specifying equipment that's quickly obtainable.

- GRAYBAR Lighting Specialists with wide experience on unusual lighting problems are ready to help you in planning layouts, choosing fixtures, and in convincing customers of the need for high standards of illumination.

- Because GRAYBAR represents more than a dozen leading manufacturers of lighting equipment, you stand a better chance of getting everything that's needed to assure a satisfactory and profitable job.

Of course, lighting is only one part of the entire field of electrical work in which GRAYBAR can back you up with sound products and competent service aid. Just call your local GRAYBAR office.

GRAYBAR in over 80 principal cities



Executive Offices:
GRAYBAR BUILDING
NEW YORK

Detroit abandons auto assembly lines for new war products. Industrial conversion is creating new wiring problems and new methods to solve them.



LAST OF THE LINE of 1942 motor cars flows off the final lines.

CONVERSION

By W. T. Stuart

CONVERSION is a wiring job. When the word went out to American industry to turn their plants into munitions factories, or else, the most complex wiring job of all time was dumped into our collective lap. The full extent of the work cannot be estimated. But it is tremendous. And right now it is taxing our industry ingenuity, raising serious problems of methods and procedure, and confirming our frequent claims that the modern wiring system ranks among the most important industrial developments since the advent of mass production.

In these days it is idle to discuss claims of relative importance among the hundreds of industries serving the nation at war. But in the tremendously significant conversion program, where every sinew is stretched for speed in turning widgets into machine guns, there are three outstanding demands—machines, electrical equipment and wiring.

The conversion program is nationwide. It is going on in Newark and Peoria, in Mobile and Spokane. But at the moment the most dramatic job in all the world is being done in Detroit. For there the automobile industry, the major

plants and the hundreds of smaller factories feeding the assembly lines with parts and gadgets, is converting existing plants to war work on a scale of baffling proportions. We went there, we talked with plant engineers, chief electricians, contractors and motor shops, in an effort to bring the readers of *Electrical Contracting* a first hand report on what conversion means to the electrical industry.

The conversion of an existing plant requires, essentially, the equivalent of rewiring for a new occupant. The new tenant is Uncle Sam. He is turning out the highly specialized machinery of the automotive industry to make way for equally specialized machinery that will make parts for tanks, guns, planes and ships. Much of the existing machinery is being used again, much is stored for the duration, at least a half billion dollars worth of new equipment is being moved in. And everywhere that changes are made, the wiring system is correspondingly altered.

Individual jobs vary as widely as the changes in production lines. Every job out of a large sheaf selected at random in one contractor's office required an increase in service capacity from 40 to

200 per cent. From this group and another similar random selection the composite conversion job among the plants normally feeding the auto industry involves the following specification:

1. Additional transformer capacity of 75 per cent of the existing installation. New switchgear and protective equipment to match the existing installation.
2. Add a new section to existing main distribution switchboard equivalent to new service capacity.
3. Run additional distribution feeders equivalent to those in place.
4. Remove existing sub-feeders and install busbar distribution systems over proposed machine areas.
5. Provide machine mounted disconnects and motor branch circuit to nearest sub-feeder.
6. Remove existing lighting equipment and install RLM standard or equivalent two lamp fluorescent units with auxiliaries corrected for power factor. Intensity shall not be less than 40 foot-candles at the working plane.

The broad picture that this composite specification shows cannot be detailed. Each job involves its own peculiar conditions, the adaptation of existing wiring and equipment to new circuits, the relo-



TWENTY DAYS LATER. A fully equipped machine line is turning out war materials where twenty days before cars were rolling off the line.

cation of existing panelboards and control, and all the other factors which are familiar on rewiring projects. The actual work in the hundreds of factories around industrial Detroit is liberally spread over plant electrical construction departments, and contractors, large and small. And jobs vary from patchwork alteration to existing systems to complete new installations from the service entrance to the last outlet.

In the major plants like Ford, Chevrolet, Plymouth, Hudson and Packard, the wiring system alterations are more complicated. Here the existing wiring systems were developed around the various demands of assembly line needs on automobiles and trucks. The new work undertaken as prime contractors is often remote in method and procedure from the existing plant plan. And wholesale conversion is not always possible at one time. As individual contracts are undertaken, a portion of the stripped plant is prepared until entire plant is occupied.

At the Plymouth Division of the Chrysler Corp., where conversion is advanced well beyond original schedules, the stripping crew followed the last cars down the line. Machine tools which had already been tagged were disconnected, and those which were not put on war work, were listed in a common pool. Fixed equipment, such as motor generator sets, out of the way of new lines, are shut down and covered for protection. Wiring connections for plugging into the bus system remain attached to the removed equipment and

new bus taps and connections are run to new machines. Up to the present approximately 5000 feet of bus work has been installed for secondary distribution and new enclosed busbar sub-feeders will be used as machine areas grow.

Although in this plant the use of high cycle equipment was considerably reduced by conversion, the use of direct current for hoists, cranes, and machine tools requiring critical speed control was greatly increased.

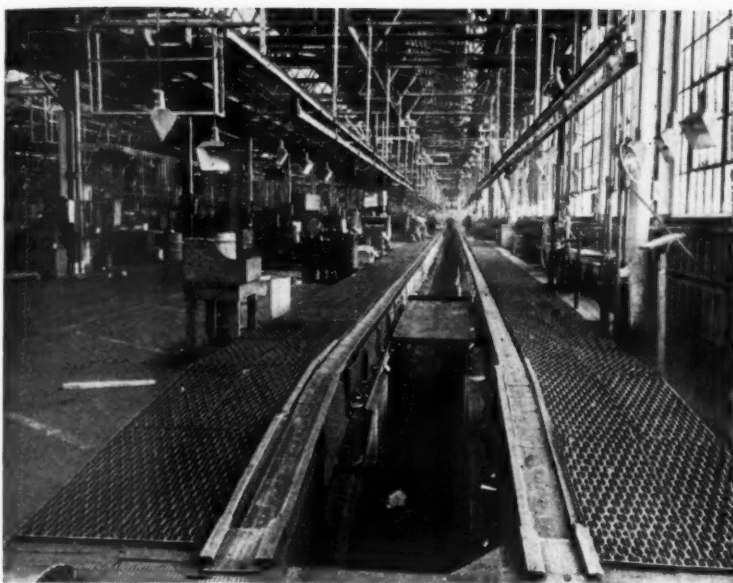
Otherwise a long established policy of standardization on flexible methods of wiring with high salvage possibilities has contributed materially to speeding rewiring as new lines are built. This standardization is now being followed on lighting with the adoption of fluorescent lighting with design intensities of 35 to 75 foot-candles wherever new equipment is installed.

In the motor shop field the conversion program is turning out large numbers of motors for general overhauling. Most are taken from shut down machines and are consequently in need of only minor repairs. The shops clean them up and check insulation resistance. A wash, varnish and bake, mechanical repairs, and a test are usually enough. Some which won't test up are stripped and rewound. Many go back directly into new service. Others are placed in the machine pool for future needs. A shop specializing in repairing small motors and tools reports no noticeable upturn in high cycle tool work but a decided increase in welder set repairs.

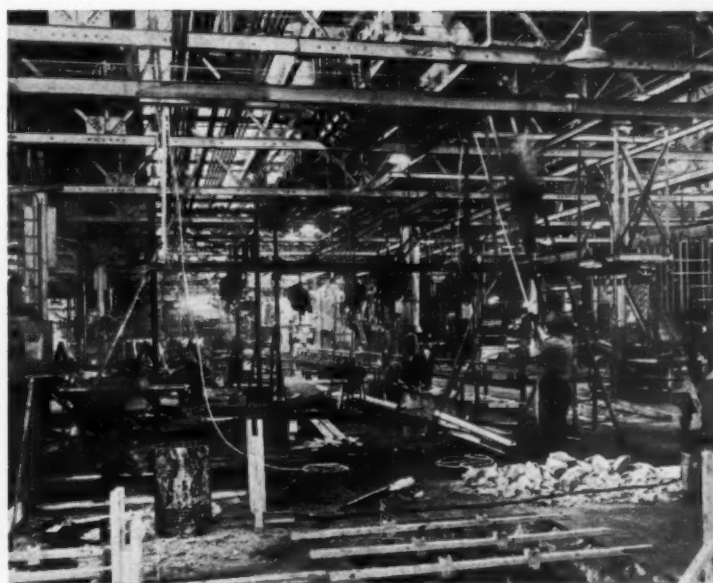
Detroit's characteristic flair for unique methods is apparent in some of the wiring systems already in operation or under construction. At Packard, for instance, heavy current welder circuits are fed from a unique concentric feeder consisting of one copper tube within another. The design holds down reactance losses. At Plymouth, extreme flexibility is provided by a secondary network of longitudinal open conductors feeding transverse sections of bus ways. Bus plugs extend in heavy "bus cable" to machines on the floor below.

Recognizing modern fluorescent lighting as a distinctly new wiring problem, design engineers have approached the system layout from a new angle. Because modern network design and the shortening of secondary feeders by the use of primary voltage distribution provides exceptional voltage stability, engineers have turned to the handy power bus as a source for feeding fluorescent lighting circuits. One plan employs bus plugs and transformers reducing conventional 480 volt power bus supply to 240 volts. The transformer secondary feeds a trolley bus which is fused as a 50 ampere sub-feeder. Individual lighting units have a fusible attachment plug protecting the fixture wiring and ballasts. No lighting control is used. The fixtures are spaced for the lighting intensity desired and remain lighted as long as the power system is energized.

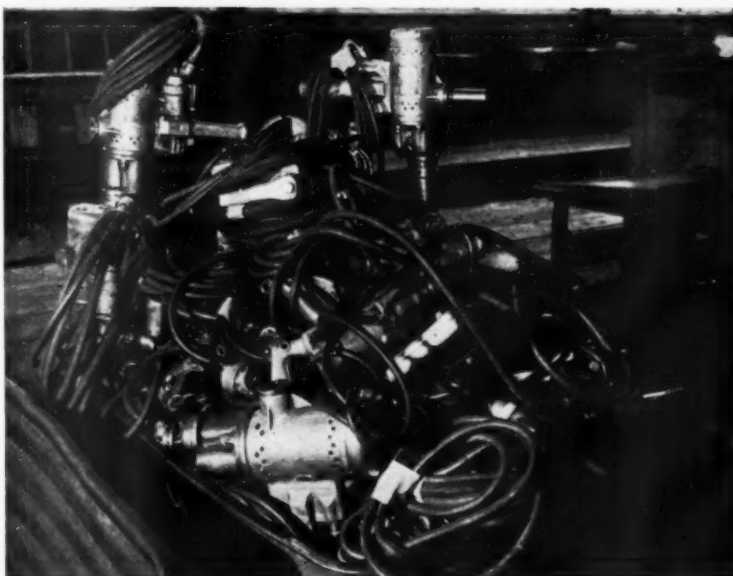
What Detroit adopts and uses so effectively cannot be drawn up as a standard of industrial wiring throughout the country. It is, characteristically, wiring for mass production. And mass production needs regular conversion year after year, even in times of peace. Extreme flexibility is of foremost importance. And high salvage value is essential if plant costs are to be kept in line. The emphasis in Detroit is inclined toward wiring systems with low installation costs, even if the materials chosen cost considerably more on the initial job. Materials can be salvaged, some can be reused without alteration, but labor costs cannot be reclaimed. And where changes are frequent apparently costly methods prove to be the strictest economy. A similar emphasis on liberal capacity design pays off in the same way. Good regulation, ready extra power facilities and wide margins for momentary loads are more important than copper economy. In an industry where cost accountants are accustomed to figuring in fractions of a cent it is noteworthy that the quality of electrical wiring systems and equipment chosen ranks well at the top.



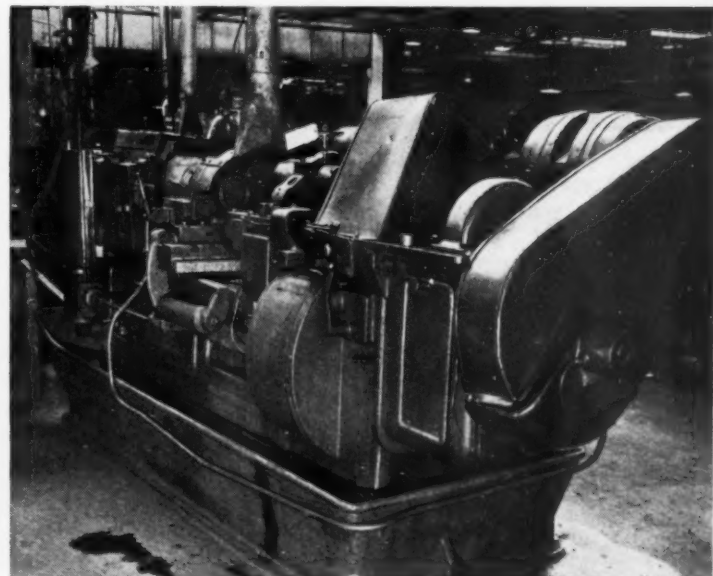
EMPTY AUTO ASSEMBLY lines wait for skilled crews to start salvaging machinery and stripping electrical equipment.



STRIPPERS WERE in action before the conveyor belts stopped rolling. Machinery was moved out, conveyor lines dismantled.

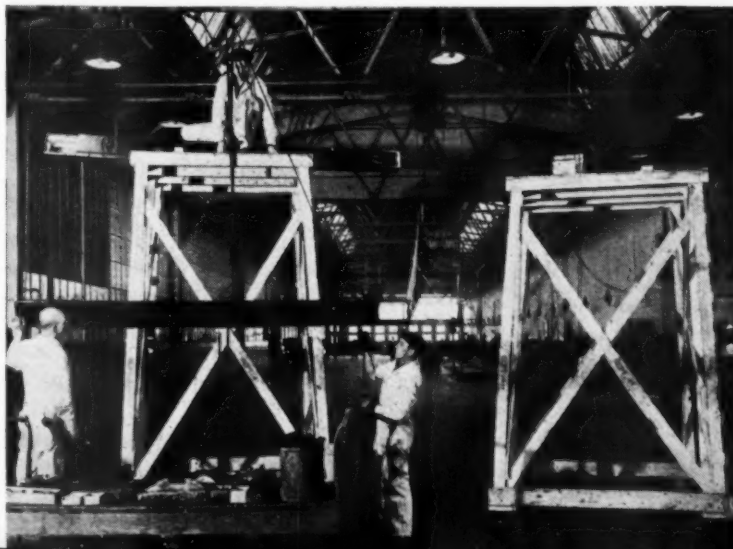


HAND TOOLS are collected, cataloged and sent to a tool pool to be drawn upon for later new production chores.



AUTOMATIC MACHINES, not immediately relocated in production lines are cataloged, tagged and sent to a common pool.

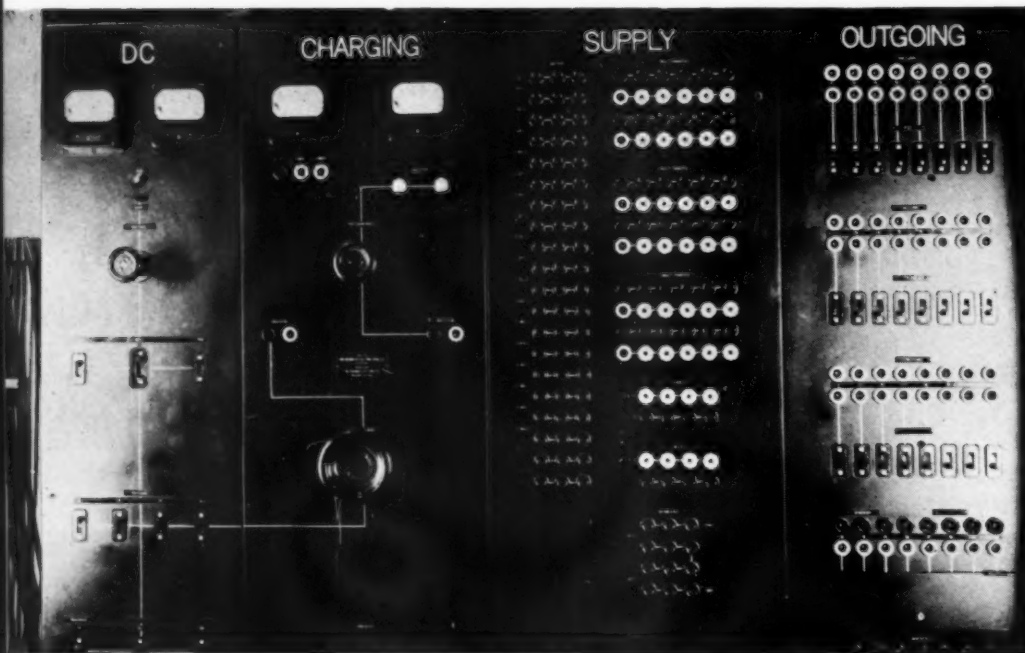
BUS SYSTEMS. Electricians rush enclosed bus bars into place in a new machine shop area. The plant is cleared and floor repaired, ready for a new war production.



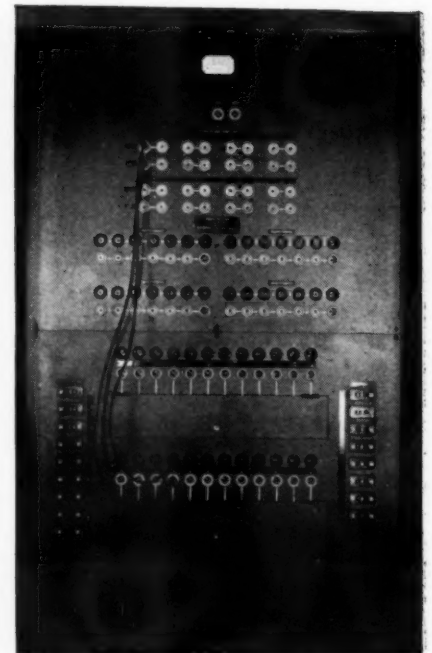
WAR PRODUCTION already under way at a Chrysler Corporation Plymouth plant—in the background space where once motor cars were assembled, is being prepared for new tools.



WIRING A LABORATORY



MAIN PANELS provide control of direct current sources and battery charging. Plug cords distribute special d.c. voltages from supply lines to outgoing trunk circuits terminating in lab panels.



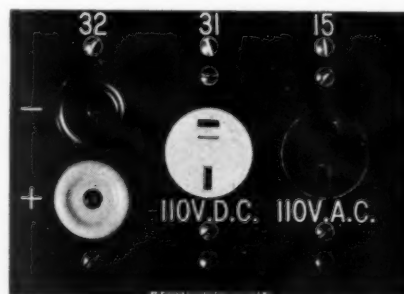
LAB PANELS distribute to table outlet circuits. Circuit breakers protect outgoing d.c. and a.c. plug receptacle circuits.

THE extensive electrical systems which modern educational laboratories require for research, study and demonstration are ingenious adaptations of conventional wiring methods with specialized switching and control equipment designed for safety, convenience and the widest possible flexibility. An installation recently completed by the Wetherbee Electric Co. for the Kansas State College in the new Physical Science Building at Manhattan, Kansas involved an electrical contract of \$58,000 or somewhat more than twice the plumbing and heating work.

The project, under the supervision of Tom I. Nall, Kansas State Architect, and Charles L. Marshall, Assistant State Architect, included a modern laboratory wiring system providing a wide selection of electrical services arranged for convenient and safe laboratory use.

The equipment consists of eight hundred laboratory outlets ranging from one to nine gang units, capable of supplying from two volts to one hundred and twenty volts of storage battery current in 2-volt steps, 110 or 220 volt single phase a.c. and 125 volt d.c. from motor generator sets at the outlets. Each laboratory outlet has the voltage, whether a.c. or d.c., and a distinguish-

ing symbol showing which circuit and panelboard it is fed from engraved upon its plate. A complete separation of various voltages and kinds of current is carried throughout the system with divider boxes and separate conduits for different kinds of current supplied. There are a total of six sub-laboratory panels on the various floors to care for circuits which are remote from the main laboratory panels. In general each of these sub-panels is fed with twenty No. 6 conductors. This large number of conductors is required in order that various combinations in 2-volt steps may be taken from the storage batteries.



LAB OUTLETS are identified with circuit numbers at the panel. Color coding and clearly engraved plates mark the various services. The terminals at the right provide battery voltages as selected at the panel.

The laboratory sub-panels are located on the second and third floors of the building, the circuits originating in the basement and on the first floor and fed from the main laboratory switchboards in the basement. The various voltages and types of current available on the main switchboards are distributed to the sub-panels and laboratory outlets by means of single conductor all rubber cords with plugs for various outgoing circuits. In general, the design of the sub-panels is similar to the main laboratory boards with the exception that they are smaller and do not have battery charging equipment and instruments mounted on them. All of the various jacks are color coded and the outgoing circuits are protected with circuit breakers and fuses in compartments accessible from the front of the boards. There are numerous multiple transfer jacks which are used to combine circuits of the same current characteristics.

Laboratory outlets are located in the walls, on the ceilings and on the laboratory tables. As many as six and seven tables are in a room, each table having approximately sixteen different outlets. Independent of the laboratory equipment system there are three power panels which supply power to various motors and pieces of equipment through-

Modern laboratory wiring aims at maximum convenience, flexibility and safety. An installation at Kansas State by Wetherbee of Oklahoma City.

By
G. F. Ehrlich

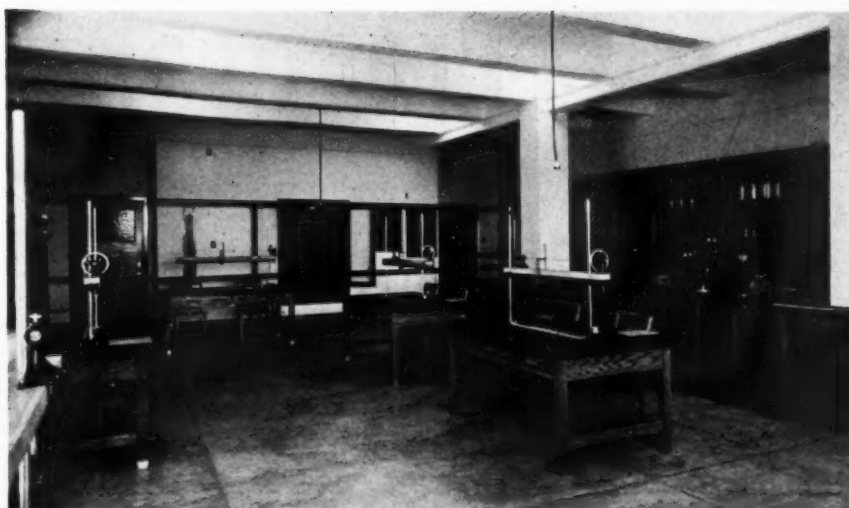
*Wetherbee Electric Co.
Oklahoma City, Okla.*

out the building. The normal lighting and receptacle circuits are fed through feeders supplying three wire, three phase current to the panels, and distributing on single phase, 220 volt to the outlets. Four special panels are provided to supply 110-220 volt service where required. In addition three high capacity panels are provided to handle high capacity outlets scattered throughout the building. These circuits have not over three outlets of this type and are fed with two No. 2 conductors. Each receptacle is protected by a circuit breaker at the receptacle location.

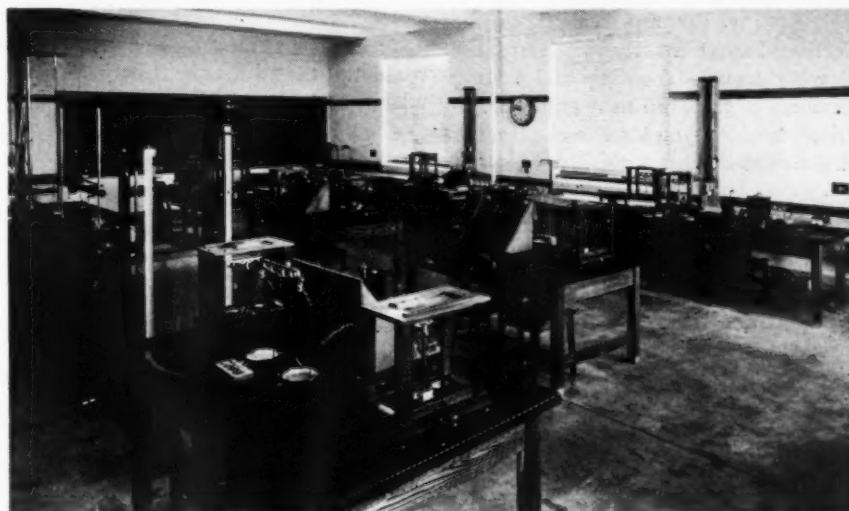
The building is arranged to handle a Department of Physics and a Department of Chemistry, each with distinct electrical laboratory equipment. The main laboratory switchboards are installed in glass enclosed rooms on the basement floor. Immediately behind is the storage battery room which contains sixty cells of Gould storage batteries of 160 ampere-hour capacity for each unit. Batteries are installed on acid proof tiered racks and the room is ventilated by forced draft ventilation. All wiring to the cells has been done with lead covered cable to avoid the corrosive effects of the storage battery fumes. A special cabinet is located in the rear of the switchboard which contains the fuses for all the battery taps entering the laboratory switchboard. Battery charging is accomplished by means of Tungar rectifier bulbs mounted on the switchboard, and in addition, a Westinghouse 5 kw. motor generator set is provided for battery charging and other 125 volt d.c. circuits. Each laboratory switchboard has its own motor generator set.

The large lecture rooms are provided with electrical outlets at the instructors table for working demonstrations and motor driven light-proof window shades darken the rooms for slides and motion pictures.

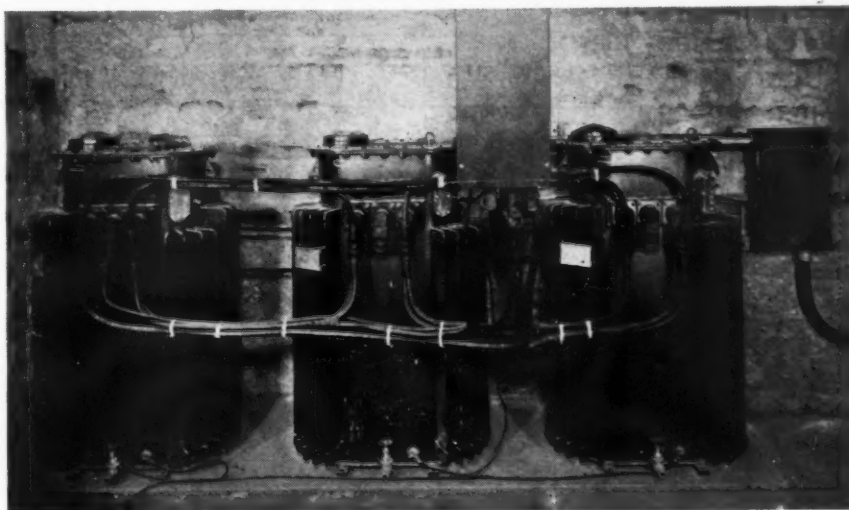
[Continued on Page 80]



CONVENIENT ACCESS to circuits and control are provided by the glass enclosed panel-board at the rear and cord drops from the ceiling outlets in this laboratory.



INSTRUCTOR TABLE outlets are built in and student outlets located at the walls in this laboratory. Standardized polarity plugs and terminals are used to connect equipment.



MAIN TRANSFORMER BANK reduces incoming 2300 volts to 230 volts, 3 phase delta for light and power. The neutral tap at left transformer provides 115 volts for a.c. laboratory outlets.

Practical Fluorescent

Tests and checks for servicing lamps, starters and ballasts.
How to shoot trouble on fluorescent lighting installations.

A good working knowledge of fluorescent lighting circuits and trouble symptoms makes the average trouble shooting job a simple step-by-step procedure. The testing equipment may be as elaborate as the electrician cares to handle, but most common defects can be uncovered by the systematic use of only a voltmeter and a dummy starter. As the cure for fluorescent troubles in the field usually involves only the replacement of the defective ballast starter or lamp, the following trouble shooting and testing procedure is prepared as a guide to detecting trouble symptoms and weeding out the offending part quickly.

When the Lamp Fails to Light

1. Check the electrical connections to be sure that voltage is available. If the lamp fails to light then the following procedure is suggested to determine the cause of the trouble.
2. Check the starter. Remove the starter from the fixture and replace it with a "dummy" or manual starter. If the ends of the lamp glow as during the starting period and it is possible to start the lamp by quickly removing the dummy starter or by switching the

manual starter to the "off" position it may be assumed that the original starter was the cause of the trouble.

3. Check the lamp. If the lamp cannot be started with the dummy or manual starter it should be checked in another fixture which is known to be operating properly, or it should be replaced by a lamp which is known to be good. If this good lamp shows no signs of life in the fixture, it indicates that there must be an open circuit. This may be due to poor contact at the sockets or it may be in the wiring or ballast.

4. Check for poor contact in the lamp socket. With the dummy starter in the starter socket, twist the lamp gently in the lamp sockets with the current turned on to see if proper contact can be made. The connection of the lead wires at the lamp sockets should be checked to see that they are tight. If a combination lamp socket and starter socket is used the connection between these two parts should be tight.

5. Check the ballast. If a check on all the above does not disclose the defective part, then the trouble must be due to a defect in the wiring or in the ballast. The wiring should be checked for an

open circuit, and if the trouble is definitely traced to the ballast it should be replaced. Some of the tests outlined in the following section may be helpful in a further analysis of the trouble.

Check Improper Connections

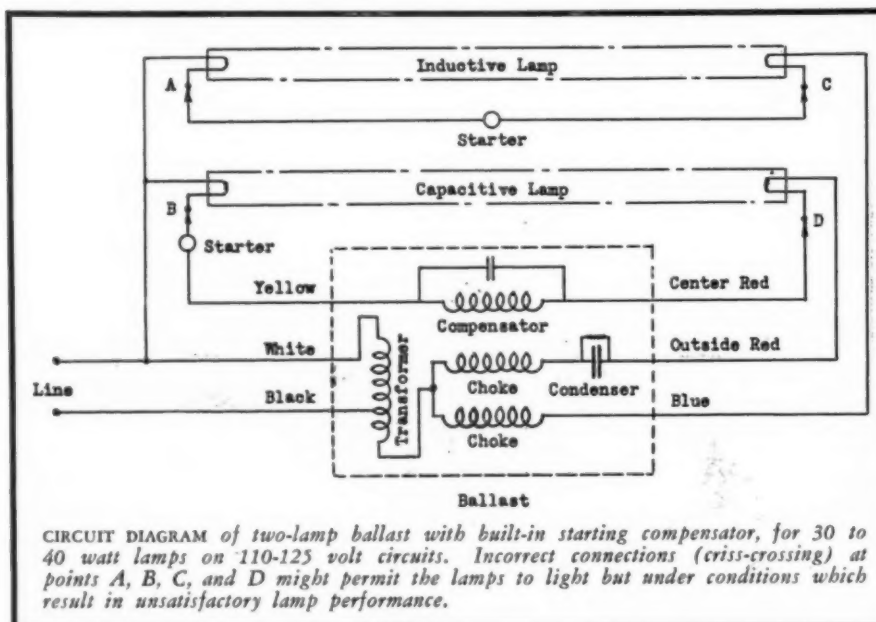
There are certain types of improper connections, particularly with two-lamp ballasts, which will permit the lamps to light but which may give rise to difficult starting and unsatisfactory lamp performance such as flickering, early blackening, and short lamp life. Outlined below are some tests which may be made by the use of a dummy starter to disclose these conditions as well as certain ballast defects which may be a cause of inadequate starting current or other conditions. It is suggested that these tests be made when the lamps have unusual difficulty in starting, or when the performance of the lamps in a fixture is considered unsatisfactory for other reasons.

6. Remove all the starters from the fixture and put all of the lamps in place in the fixture. Lamps which have been previously checked and are known to be good should be used for all of the tests described below.

7. Place the dummy starter in one of the starter sockets. There should be a glow from each end of the lamp to which the starter is connected, as during the preheating period. This is a reasonably good indication that the circuit is properly connected. Each lamp should be checked separately in this manner.

8. If there is no glow from the ends of the lamp with the dummy starter in place and if the lamp does not make any effort to start when the dummy starter is quickly removed, it indicates that there is an open circuit in the wiring for that lamp.

9. If there is no visible fluorescent glow from the ends of the lamp, but if the lamp does make an effort to light when the dummy starter is quickly removed, it indicates that the lamp is not receiving proper preheating current.



Servicing

By Harris Reinhardt

Hygrade-Sylvania Corp.

This may be due to low line voltage, improper connections, omission of the starting compensator or improperly designed ballast. It should be emphasized that this test should be made with a lamp which is known to give normal end glow in a proper circuit.

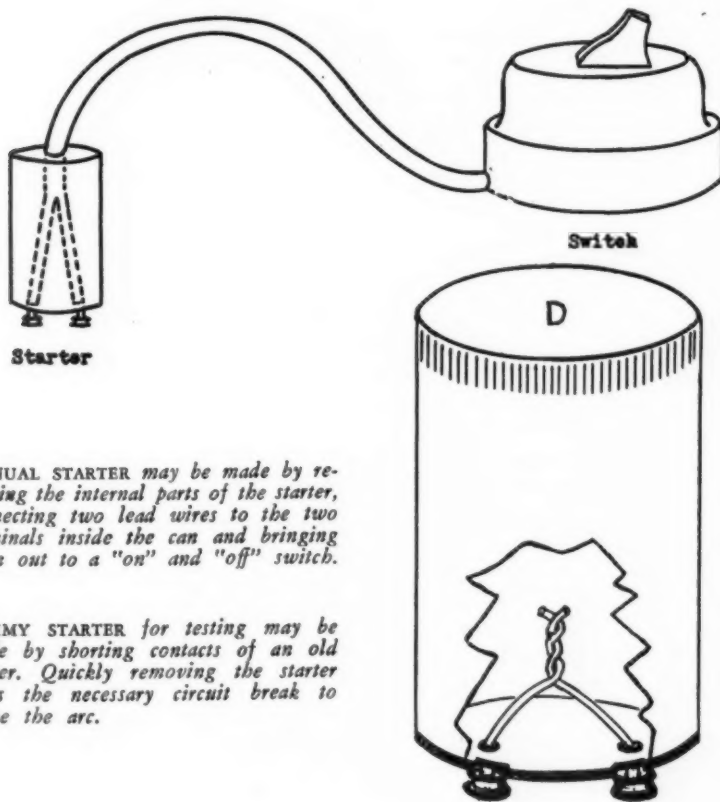
10. If there is a fluorescent glow from one end of one lamp and also from one end of one of the other lamps with all starters removed from the fixture except the one dummy starter, it indicates that the starter leads for the two lamps have been criss-crossed.

11. If there is a fluorescent glow from only one end of one lamp with only the one dummy starter in the fixture, remove all the lamps from the fixture and then insert only one end of the lamp in the one socket at which the glow previously appeared. If this end of the lamp shows a glow under this condition it indicates a short circuit or ground either in the wiring or in the ballast. The most

probable place for a ground is at one of the lamp sockets, particularly if the socket is mounted on metal.

12. If the lamp lights up over its entire length and remains lighted with the dummy starter still in the socket, it indicates a condition known as resonant starting. To check this further, turn off the line switch and after about 30

seconds turn it on again with the dummy starter still in place. If the lamp lights immediately when the line switch is turned on, it definitely indicates that a resonant or cold starting condition exists. This condition occurs only in a two-lamp ballast and can occur on only the capacitive lamp. A ballast which produces resonant starting should be replaced since it will cause short lamp life.



How to Shoot Trouble

Listed below are a number of conditions or operating difficulties which might be experienced in fluorescent lamp applications, together with various practical suggestions for determining the cause and correcting the condition.

13. If the lamp blinks with definite "on" and "off" period, this may be caused by normal failure of the lamp in which case ends will be darkened and the glow during preheating period will be distinctly red, but the arc is either not established or is characterized by a shimmering effect during the short time the lamp remains lighted.

Remove the starter while the lamp is lighted and if the blinking stops then the starter is the cause. This does not necessarily mean that the starter is defective since it may be caused by:

- (a) *Starter of wrong size.* A starter designed for 15 and 20 watt lamps, for example, will cause a 30 or 40 watt lamp to blink on and off.

[Continued on page 54]

Cutting Welder Maintenance

Electric welders play an important role in the fabrication of modern war implements. Here's how one large plant reduced its electric welder maintenance to a minimum.

By **George Palm** *President, Chicago Electrical Maintenance Engineers*

WE are all familiar with the increasingly important part that electric welding plays in steel construction today, whether it be for railroad cars, shipbuilding or the fabrication of the numerous items that constitute military materiel. And most of us, who have worked with or among electric welder units, know the problem of maintenance, especially when the units are used in locations where the atmosphere is loaded with dust and dirt.

In the large midwest industrial plant where I have charge of all electrical and mechanical maintenance, we use electrical welding to a large extent in our production lines. In fact, we utilize about 175 portable units of the 400 ampere size. Naturally, wherever metal is fabricated, the surrounding air will be heavy with dust and dirt. All of which isn't too healthy a condition for the welders operating in that area.

Our Battle With Dust

Before we really began to attack the problem of electric welder maintenance we had to maintain a crew of six men, whose sole duty it was to blow the dust and dirt out of the welding units. To do a thorough job this required dismantling the unit and pulling out the armature. Conditions were such that we had to blow the welders out once a week. When you consider we had 175 units working continuously you can realize what a crimp that put into our production schedule.

With defense orders coming in and with our production schedules strained to the utmost, we just couldn't afford to take the units out of service so frequently. At the same time the presence of dust and dirt in the units reduced air circulation and hence the efficiency of the unit. So we sat down to tackle the problem once and for all.

Our first stab at the problem was to elevate as many of the units as possible to get them up off the floor so they wouldn't draw in as much dust and dirt. Wherever possible we grouped units permanently, similar to those shown in sketch No. 1.

Here we have eight units, with their portable trucks removed and mounted in a mezzanine balcony. All control equipment is consolidated on a compact board directly under the balcony. The board itself contains eight receptacles which are connected directly to the welder generators. Below these receptacles are 16 plugs which are connected under the floor to 16 receptacles spotted on columns throughout the shop area. These plugs are connected to flexible single conductor, heavy duty rubber cords which can be pulled out sufficiently so the plugs can be connected to any one of the eight receptacles above. A ground cable runs under the floor to ground all pedestals or framework on which the object to be welded rests. Thus, the return circuit is completed.

The circuit breakers for the welder motors are mounted directly above the board and are connected to a long wiring trough. On either side of the board, and mounted on separate hinged frames of angle iron, are the eight control units for the welders. Four are located on each side of the board. Flexible connections at the back tie these control boxes in with the conduits leading to the welders above. When any control box needs repairs, it is simply swung out on its hinged frame and worked on from the front. All welders, controls, breakers, receptacles, plugs at the board and column receptacles are numbered to correspond to the unit to which they are connected.

Similar compact arrangements of welder and control boards, using fewer

welders, are constructed on a framework that is portable. The complete unit can be lifted by an overhead traveling crane and placed where needed most.

Placing the welders in compact groups on mezzanines, helped tremend-

Fig. 1

CENTRALIZED CONTROL of shop welding is accomplished by mounting units on a mezzanine with a compact control panel beneath. Numerous column receptacles can be connected to any one of the eight welder units through the plug and receptacles on the board.

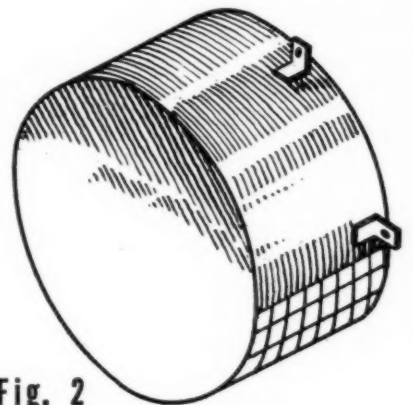


Fig. 2

CONVENTIONAL END BELL on the welders, although almost totally enclosed, permits dirt and dust to be drawn into the motor and generator of the unit.

ously in releasing much needed floor area for working operations and centralized control to a great degree. It also reduced the welder maintenance but not as much as we desired.

The next idea we hit upon was the use of spun glass pads as air filters on the welder units. Since dust and dirt were causing much of our maintenance problem, why not filter the air circulating through the welders and get rid of the dirt?

400 Amp. Welding Units with Spun Glass Air Filter End Bells

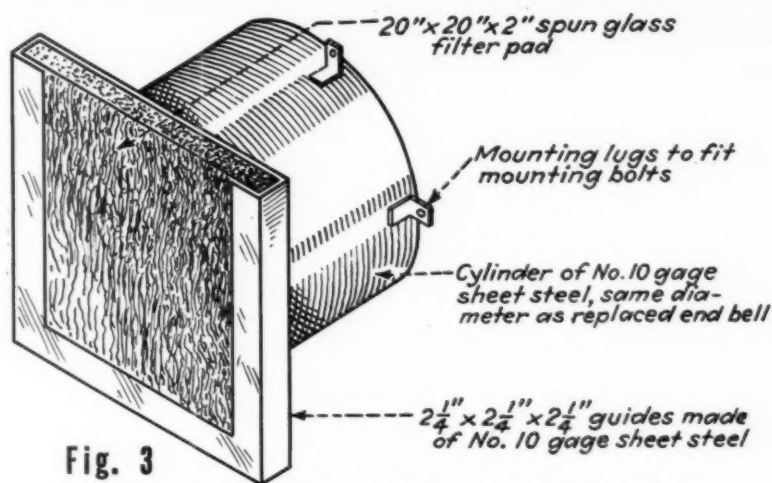
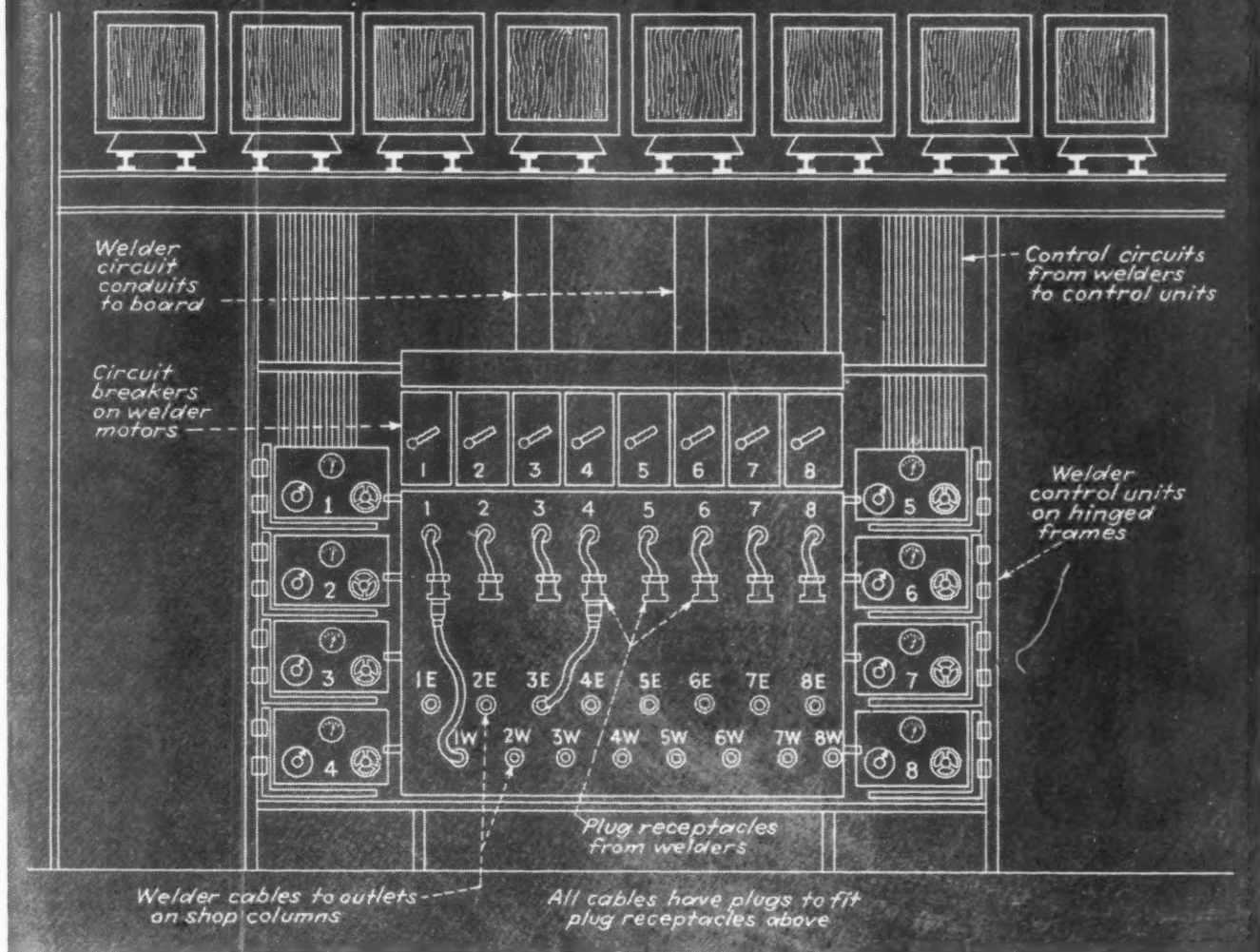


Fig. 3

AIR FILTER PAD of spun glass inserted in a special end bell, cleans the air that circulates through the welder unit. Maintenance of unit is drastically reduced and high operating efficiency is maintained.

However, to do this we had to have a special end shield on the intake end of the welder unit. So we removed the conventional sheet metal end shield, shown in figure 2, and replaced it with a special one we constructed, as shown in figure 3. This was made of No. 10 gauge sheet metal and fitted with a holder for a 20-in. by 20-in. by 2-in. spun glass filter pad.

These new end bells are made up in lots and several are kept on hand so we

can quickly place them on any new welder units that we may get. They are built to fit the regular mounting bolts of the regular end bells of the welder.

Better than 90 percent of all the welders we have are now fitted with these air filters and soon all will be.

The filter pads really do the trick. We change the filter pads on the mezzanine welders only once every 30 days and on the portable units on the floor

about once every two weeks. And it doesn't require a shut-down—just pull out the dirty pad and insert a clean one. Filter pads cost about \$1.00 each and the cleaning, which is done by a company specializing in this work, costs about 50 cents per pad. Compared with our previous maintenance costs this is real economy.

The blowing out operation is done only once every three or four months now, as compared to once a week before. Now, when a welder is blown out, it is completely overhauled. And we use only one man for the maintenance job as compared to six previously.

The use of these filters need not be limited to welders used indoors. They should work equally well on outdoor work and will be of considerable help on construction jobs where dust and dirt are always prevalent.

So you can see the tremendous saving effected by the use of the filters, not only from a monetary point of view, but from the time and labor saving angle. And this is especially important today when plants are operating 24 hours a day and seven days a week. Production must be maintained at top speed and reduced maintenance such as this helps in its small way.



NISA Looks Ahead



By

Leonce Bonnezaze, Jr.

President, National Industrial Service Association

IN war, every venture that consumes the time and skill and thought of men is a subject for critical appraisal, but we may be proud of how our industry and the National Industrial Service Association has adapted itself to the war effort. Our members have undertaken critical war work, some on twenty-four hour schedules and have made it possible for many essential industries to meet the urgent demands for increased production, by providing thousands of additional horsepower in rebuilt motors. By acting as a clearing house for our industry, this association has rendered invaluable service in this essential work.

In an association like ours, the benefits of membership are first of all the rewards of cooperative effort. We have the opportunity to share in each others judgment and experience, to contribute and to receive the best practical knowledge that concerns our industry. And out of this free and cordial cooperation the standards of all the industry are elevated, but NISA has an impressive record of performance and services. Projects for all the members have been developed through the years. Several are now closely geared to the war effort. They include—

1. Priorities Reports. Through the central offices, reports on priorities developments are issued in bulletins to all members. Close contact with WPB headquarters in Washington keeps ma-

terial up to date and members promptly informed. NISA headquarters also interprets priority and allocation actions bearing on other industry groups where they affect members directly or indirectly.

2. Code of Ethics. During the past year NISA adopted a formal Code of Ethics. The high standards of business conduct and business relationships which membership in NISA demands is thus codified, published and recorded for its members as a constant reminder of the responsibilities of membership.

3. Certified Repairs. Further progress has been made on the certified repairs plan which sets up standards of technical ability, shop equipment and accounting practices. Many shops have voluntarily adopted the standards of practice required to operate under the plan.

4. Data Bureau. The central pool for exchanging rewinding data has been further built up during the past year. This file has provided urgently needed information in recent months for the rehabilitation of much old equipment drafted into essential war work. The data is accessible to all members.

5. Rebuilt Equipment Exchange. The facilities of NISA for exchanging information on available used equipment gives each member a list of the stocks

How the National Industrial Service Association is geared to the problems of war. A statement by the president of the motor shop organization as its members prepare for the annual Convention in Cincinnati, May 4-6.

of other members. Many essential jobs have been expedited by a telegraphic round-up of needed equipment from distant sources. The exchange speeds the return of rebuilt equipment to useful industrial work and expedites turnover on items for which there is a limited or spotty demand.

6. Technical Research. A committee of NISA members studies shop practices, machines and tools to advise on improved methods for the benefit of individual shops and the industry.

7. Cost Analysis. Factors affecting primary costs and overhead are constantly under study by committees composed of leading members of the industry, and the reports of these committees form a valuable basis of comparison for the members to determine the efficiency of their own operations.

8. Legislation. A committee keeps a vigilant watch on legislation affecting

(Continued on Page 73)

FEEL THE POWER OF A KNOWN NAME!



(Above) C-H Type MO Two-circuit Multi-Breaker especially suited for small, prefabricated defense housing units where no electric range or water heater is planned.

(Below) C-H Type MB Multi-Breaker for larger 5 or 6 room permanent type defense homes. Circuit for electric ranges optional.



Push Cutler-Hammer Multi-Breakers for Defense Housing Projects

THERE'S no question about the type of electrical equipment you will need to feature to get into the red-hot "housing for defense" market. The job calls for safe, convenient, modern equipment... and fast delivery.

You offer all those—plus...when you feature, push and install Cutler-Hammer Multi-Breakers. The plus is the ad-

vanced Cutler-Hammer Engineering, a known reputation for manufacturing excellence, the acceptance of Cutler-Hammer by all Housing Authorities, and the weight of a world famous name. That's a combination you won't beat. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wis. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ont.



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Editorials

Watch for Sabotage

At a recent inspectors meeting in Buffalo a representative of FBI urged a constant watch for evidence of sabotage. Electrical inspectors, with their skillful methods and critical study of electrical systems can spot efforts at sabotage readily, he said, and they should report any suspicious conditions immediately.

The same request should be passed on to all electrical construction and maintenance men, for they can spot not only the visible attempts at sabotage but they can observe other signs of tampering that every day routine would show up. A pull box recently opened, for instance, or main circuit breaker settings altered would be immediate cause for suspicion to the man who lived with the system.

The important thing is to get an explanation for every defect or change. If the cause isn't obvious report it. It is worth making a hundred useless reports rather than let one real attempt at sabotage go unreported.

Check Motors Now

In converting industrial plants for new war jobs there is a necessary delay while new production lines are organized, wiring installed and new equipment set in place, an excellent opportunity to test, check and repair the motor and control equipment that will be used again.

One of the best practices, already standard in some of the automobile plants, makes a motor and control check a routine operation when a machine is shut down. An instrument test checks the insulation of the motor windings and a sub-standard reading

promptly despatches the motor to the shop for a bake and varnish or rewind if necessary. It must be remembered that equipment reused on conversion jobs is going to work for the duration, frequently on day and night schedules. A thorough overhauling now uses no production time.

Important Sessions

At the National Industrial Service Association convention in Cincinnati next month there will be the usual corridor shop talk and hotel room conferences on new machines and motor shop methods. But in this normally business-like, well planned meeting there will be an even more serious tone than in previous years. For the motor shop business has been turned almost completely into critically important work for the war effort.

Today service shops are working long hours to keep industrial wheels turning, to repair the inevitable wear and tear on overworked electrical equipment and in many cases to turn out essential "bits and pieces" on the unused time of machine shop equipment. They are doing a hard job well. Because in recent years through the goading of industry leaders, and the efforts of tireless committees the industry was prepared.

Compare, if you will, the clean, well equipped plants of some of NISA's leading members with the repair shops of the 20's. This change isn't the result of so many independent individuals going their own ways. It is the result of planning, a ready willingness to exchange ideas and methods and, most of all, industry thinking. It has become a point of pride for a NISA member to welcome other members to his shop and to give freely of his own

experience and judgment for the help and advancement of his fellows.

The Cincinnati meeting will reflect this attitude in the meeting room and in the lobbies. As usual the program will be down to earth with plenty of experience reports and open discussions. It will be a meeting well worth attending, even in these days when time is so scarce.

Controls for Window Lights

The order has finally come down from OCD that store windows and signs in some areas must be extinguished unless provisions are made for convenient or automatic switching in air raid alerts. No precise specifications on the method to be used are issued, nor is it likely that they will be necessary.

There are several ingenious devices appearing which provide automatic control. One is a photoelectric tube aimed at a nearby street light. When the street lights go out, the device opens a relay which drops out the circuit contactor.

Other automatic controls use the carrier wave of a nearby broadcasting station. A simplified radio receiver, tuned to the station, operates relay which may control the circuit contactor. A time delay device prevents momentary carrier interruption from affecting the circuit.

It is up to us now to see that the wiring and control used is safe.

Award and Tribute

With simple gracious ceremony, Charles E. Swartzbaugh, acting for the Committee of Awards, presented the McGraw Award Medal for Cooperation for 1940 to Earl Whitehorne posthumously. The citation, read in the flickering glow from the fireplace he loved and echoing from the rows of his well thumbed books, absorbed something of the man it honored. His widow received the medal and purse at her home.

Earl Whitehorne was informed of his selection by the award committee while he was convalescing from a serious illness. Plans for the formal award were delayed until he could assume his familiar place at the speakers table. It would have been a gala affair, for few men enjoyed such a

huge circle of friends. It was not to be, however. He died last October.

Few men ever deserved the honor more than he and the judges' choice was never more popular. His practical idealism, wisdom and helpfulness exerted a vital influence on a whole generation of men and women in the electrical industry. We need more of his kind of practical idealism today. We have a big job to do. It may take radical changes in our industry relationships before this war is over.

To Earl Whitehorne, cooperation was more than good business ethics. He saw it as broad industry promotion aimed at the customers wants with every branch profiting in the forward progress of all. Rewiring especially he saw as a cooperative job. Today we are rewiring Industrial America for war. So far we are doing the job by conventional business methods. But conversion may prove a staggering load to handle by individual efforts. It may take a type of cooperative group that has not yet appeared; a group of specialists in industrial wiring with a complete consulting engineering staff prepared to take over conversion work at a 24 hour pace with only a machine layout to start.

Further Wage Increases Dangerous

Contractors on the West Coast have been notified by union business agents that they want to negotiate for an upward revision of wage rates. The parade was started by the plumbers and before it finishes the spiral of inflation will have run up several more notches and the war, costly enough at best, will run up in cost still higher. For it may have to be paid for, not in the inflated dollars of today, but in the deflated ones of tomorrow.

These demands for wage increases come, they say, from increased costs of living. True, but the spiral of wages contributes to higher living costs.

It all arises from an unwillingness to face the hard and unwelcome fact that this war must be paid for out of current earnings as well as future ones. That means reducing the present standards of living to pay out of present wages and salaries these increased costs of bare living, eliminating luxuries, getting down to plain old fashioned hard work and lean living because the stake is worth the price. It means, instead of kidding ourselves

with ideas of higher wages to pay increased living costs, that we learn to take a pride in getting along on less, living a harder but healthier life, take pleasure in accomplishing this seemingly impossible job of out-producing, out-fighting, out-toughening our enemies.

New Joint Method Needed

Because of the critical rubber shortage, quantities of high grade rubber tape are available in some areas only on high priority ratings. And there is some talk of developing new methods of insulating joints to preserve high insulation resistance standards on wiring systems and for essential repair jobs.

One method proposes the use of ordinary cotton tape, familiar in the motor shop, sealed on with friction tape and the entire joint dipped in an insulating varnish.

The problem deserves the most careful study. The unusually excellent rubber splicing tapes of recent years has us badly spoiled. Applied with any reasonable skill, it made anything but a perfectly insulated joint next to impossible.

Other insulating means, with the exception of the ceramic or plastic connectors, will require a greater measure of skill and a consequent increase in labor units where splices are involved. Consequently, it is unlikely that substitute methods will displace the preferred rubber tape if it can be obtained. With the present outlook in rubber supply, however, we ought to have appropriate methods at hand.

Idle Tools Are Wanted

There is still much idle machine tool capacity in the land that could be fighting the Axis. In motor shops, for instance, there are often unused machines side-tracked for want of repair and replaced by more modern equipment.

Idle machine tools should be rounded up and recorded with the War Production Board at once. For each available machine that can be put into useful production now steps up our war goals by the number of man hours it would take to produce a new tool. And even moments count.

Back Talk

Surveys Help Conversion

To the Editor—"Your editorial 'Surveys for Conversion' is very interesting and, I think, calls attention to a desirable and necessary activity. Certainly conditions are such that more and more contractors and wiremen, particularly the smaller organizations, are going to find themselves in a position where they cannot go ahead with some regular lines of work. If these organizations spend a little time and energy in following up the kind of surveys which you have suggested, it should put them in a position to make important recommendations to employers and building owners.

"At the same time it may be that in some surveys these men will find there are certain plants which are now equipped in such a way as to be adapted for special work which must be done and I would think that it would be very helpful to all concerned to have this information.

"I think your articles are decidedly helpful."

**J. E. Wise, Electrical Engineer
Industrial Commission
State of Wisconsin**

More and more the electrical system is becoming a vital link between the past process and the new war work in industrial conversion. The conversion can be speeded and the usefulness of the wiring system for future changes enhanced by a good survey job on the existing wiring and equipment ahead of time.

"Didn't Like It"

To the Editor—"Your editorial on 'Didn't Like It' in the March issue of *Electrical Contracting* was read with interest. I think this editorial was uncalled for, I happen to be a contractor in one of the interior towns that you spoke of, however, fortunate in the fact that I do have material to finish up the work that I have started.

"I feel sorry for the contractors that have started work and then find that they cannot get the material to finish up the job. These men are to be pitied not criticized.

"I am located quite a distance from the defense industry centers in this state. There are many contractors located just as I am and I don't blame them for figuring every job that came up in their locality, some of this work probably meant their existence in order that they could stay in business and serve their community."

**T. J. Bowman,
Altavista, Va.**

The editorial "Didn't Like It" was neither critical nor directed at those contractors who are cautiously using existing stocks to carry on. It was a warning to those who blindly or deliberately take on work under binding contracts for which they do not have and cannot obtain materials. For those who took such contracts before the critical materials situation was fully evident, there is deep concern and in many instances priorities assistance with a PD-1. When the time comes, and it must come soon, when Washington takes some action to help preserve the very essential public service performed by electrical contractors in areas where there is not enough priorities work to permit commercial survival under present restrictions, our case won't be helped by evidence of "business as usual" or attempts to circumvent the law of the land.

A thorough knowledge of priorities and materials available is the first responsibility of every contractor today. It comes ahead of estimating or sales work or even labor relations. Our deepest sympathy for the plight of any group or individual cannot alter that simple fact. We are no more justified in ignoring priority rules in our contract relations because we need a job than we would be in bidding below cost.

**Sell the lamps with
proven dependability**



Westinghouse Mazda



Throughout the nation, hundreds of plants and factories are doing more work and doing it faster with the help of Westinghouse Mazda Fluorescent Lamps.

These efficient lamps are needed and wanted by busy plant owners and operators to help speed production. People realize Westinghouse is the 55-year-old company with the proven reputation for sound engineering and precision manufacturing. When you say, "Westinghouse Mazda," your customers know you are recommending the top-quality lamps that give dependable, economical performance.

And with Westinghouse as your partner, you are assured of all the latest technical developments and improvements in fluorescent. Cash in on the added respect and quality the name Westinghouse Mazda adds to your fluorescent story and specify Westinghouse Mazda Fluorescent Lamps on every job.



Brighter lamps are important to America's war program

Speed is essential to America's war production program. And, today's Westinghouse Mazda Fluorescent Lamps provide the brighter, more abundant light needed to help speed production. These efficient lamps make seeing easier and thus enable workers to work faster, produce more with improved accuracy. That's why you're helping your customers to greater production efficiency when you sell Westinghouse Mazda Fluorescent Lamps.

And, be sure to enlist the cooperation of your Westinghouse Mazda Lamp Distributor. He is constantly informed of the latest developments in fluorescent and is thoroughly familiar with time-saving practices in designing and installing economical lighting systems. Make use of his many helpful services by calling or writing him today. Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, New Jersey.

*For **DEPENDABLE** Fluorescent Lighting consult your*
Westinghouse MAZDA LAMP DISTRIBUTOR

WIRING Methods

RETURN CURRENTS

To provide experimental data on bare neutral wiring, engineers of the Kansas City Power & Light Co., in cooperation with the Squire Electric Company, electrical contractors, Kansas City, Mo., applied uninsulated neutral design in a warehouse. Current readings were taken at several points on the return circuit under conditions of maximum unbalance produced by opening each outside service conductor alternately.

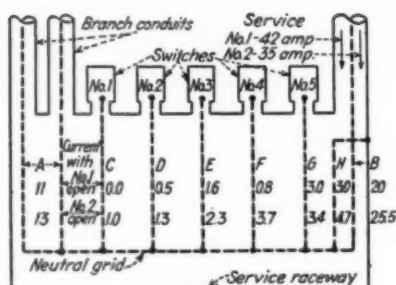
The building is an all-metal structure, 60 by 120 ft. Service conductors, three No. 6 wires on single phase, 3-wire, 115/230 volts, enter a service raceway of 16-gage galvanized metal, 28-in. long, 6-in. wide and 2½-in. deep.

Five 3-pole, 30 amp., S.N. service switches are mounted on a metal support above the service raceway. The line side of the switches are paralleled across the service conductor, the load side provides five 3-wire, branch circuits to the building.

The load consists of three rows of lights, nine to a row, lengthwise of the building, three plug receptacles and



OUTLET CONNECTION showing the bare neutral bond within the outlet box.



CIRCUIT DIAGRAM showing points of return current test and readings obtained.

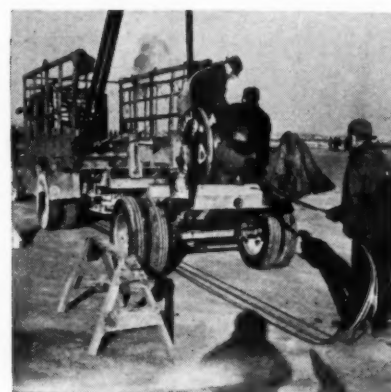
eight exterior floodlights. The electric metallic tubing system and fixtures are suspended from roof trusses with the additional support of a ½-in. messenger strand. Two conduits from junction boxes in the conduit runs extended to the service raceway.

The "hot" wires are type RP, No. 12, conductors. The neutral conductor is a bare No. 12, forming a solid network through the system bonded to each outlet box and to each service switch.

In testing the distribution of current flow under conditions of maximum unbalance, readings were taken in each part of the return circuit. With one service conductor open and 35 amp. flowing through the opposite side, 20 amp. appeared at the service neutral, of which 11 amperes returned by way of the neutral conductors and the rest through the conduit system. The remainder of the current, 15 amperes, returned by the way of the building frame to the transformer neutral ground.

REEL TRAILERS

Dual-wheeled reel trailers coupled to trucks complete with boom equipment were used by the H. P. Foley Company, electrical contractors of Washington, D. C., to pull in some sixty-odd miles of lead covered cables over an area of more than 700 acres at the new Washington National Airport.



MOTORIZED TRAILER and truck units facilitate measuring and installing underground cables for various field lighting circuits at the Washington National Airport.

The booms were used to hoist reels on and off the trailers. One truck-trailer combination would ride along the underground conduit run paying out the single conductor cable to be cut to proper length. A second unit would follow to rewind the three, six or whatever multiple of single cables were for that conduit, on a second reel which would be deposited with the trailer at the proper feed-in handhole. The truck would then unhook and go to the pulling handhole, attach the fish cable and pull in the conductors.

Use of these methods permitted the contractor to transport men and install material along the mile-long runways and around the periphery of the field in record time.

STORAGE BATTERY RACK

The multiple voltage laboratory of the National Institute of Health in Bethesda, Maryland, is served by a battery room



STEEL TROUGHS with removable and bushed covers enclose conductors from multi-voltage switchboard to this storage battery rack.

Goal Ahead

*L*ike every thinking American, we are all out for Victory—Victory at the earliest possible moment.

Most of the 41 years of Youngstown's history have been years of peace. Like you, we look forward confidently to that day when steel can turn from its terrible work of destruction to the constructive task of restoring the foundations and rebuilding the structure of our national health and prosperity and happiness.

Victory when it comes must be unqualified, and complete. Victory calls for hard work—unstinted, total effort. So let us devote every machine and every ounce of manpower to the winning of the war. That is American Industry's task for TODAY— not tomorrow, but NOW.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO

25-31E

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

TO HELP WIN THIS WAR CRESCENT

**Manufactures ALL
TYPES OF ELECTRICAL
WIRES & CABLES**



CRESCENT
is all out for WAR!
Buy through your
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CRESCENT INSULATED WIRE & CABLE CO.



CRESCENT WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

ASK YOUR WHOLESALER

CRESCENT ENDURITE SUPER • AGING INSULATION

VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE



[FROM PAGE 32]

which provided d.c. voltages from 0 to 120 volts in two volt steps.

The batteries are mounted on a three-tier rack, the upper row containing 22 and the other rows each containing 21 cells. The cells rest on two 2-in. by 4½-in. wood stringers and are fed by steel wiring troughs, one for each tier of cells. These troughs are 18-ft. long and 4-in. by 6-in. in cross sections with removable screw covers on the front face.

These covers contain porcelain bushed holes through which the continuous lead covered cables from the switchboard lead to the battery terminals. Each conductor is carefully taped from the battery terminal to the trough to prevent damage from the battery acid. All cables go straight to the switchboard in similar steel troughs provided with removable cover sections for easy access and maintenance.

A spare double-tier rack is provided in the far corner of the room, complete with coiled battery leads for a future bank of cells. The entire electrical installation was made by E. C. Ernst, Inc., electrical contractors of Washington, D. C.

ADJUSTABLE LADDER RACK

Ladders can be the handiest devices or the biggest nuisances, depending on where they are—on the job working, or cluttering up the place while off the job. But ladders have a place of their own and are generally in their place at the new shop of California Electric Co., of Oakland, Calif.

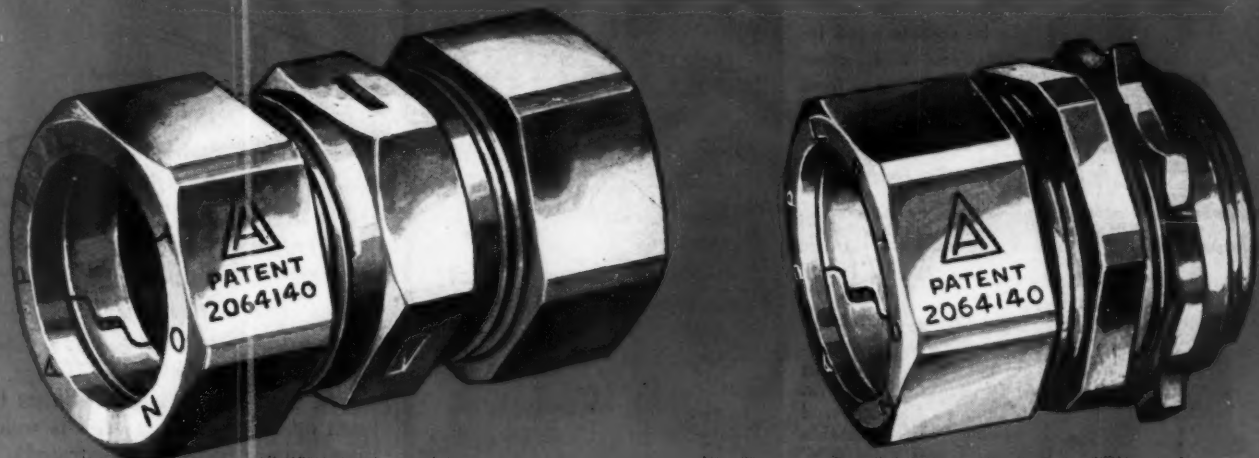
One of the chief convenience features of the new place is a drive-in yard



LADDER RACK with adjustable supports is suspended from the joists of an outdoor shed.

Outstanding Leadership!

APPLETON COUPLINGS AND CONNECTORS for Electrical Metallic Tubing — More now in service than all other makes combined!



There are sound reasons for this outstanding Appleton leadership!

Appleton Gland Ring Couplings and Connectors make a rigid, permanent tubing connection that is **approved watertight!**

The concave, piston ring type of gripping ring insures an easy fit on tubing cut in the field with a hack saw, thereby assuring a positive grip and extreme rigidity in the completed installation.

It is not necessary to use more than *one type* of fitting when you standardize on Appleton Couplings and Connectors. They are expertly designed, and made in Appleton factories to high specification standards. They embody every important improvement for fittings of their type. Heavily cadmium coated.

All sizes have hexagonal nuts, and hexagonal center sections, which are easily held rigidly with a wrench while tightening. Connectors have high knockout closing shoulders, and are equipped with bonding type lock-nuts, which fasten securely to outlet boxes, panel boxes, and other equipment. Competitively priced!

Appleton stocks are complete; service is prompt and dependable. Costly delays are avoided by specifying *Appleton Fittings*—STANDARD FOR BETTER WIRING!

Sold Through Wholesalers

APPLETON ELECTRIC COMPANY 1704 WELLINGTON AVENUE CHICAGO, ILLINOIS

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Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Pittsburgh, Seattle



The name "Appleton," the registered trademark, "Unilets" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. We manufacture no private brand goods!

KEY TO QUICK WORK



APPLETON UTILITY TOOL

Takes the place, on tubing jobs, of *all other tools* but the hack saw! Tightens nuts, reams, removes burrs. Working with two Utility Tools, the electrician can grip the coupling or connector with one, draw up the nut with the other. Makes tubing installation fast and easy, even in tight places!

A P P L E T O N

Conduit Fittings • Outlet and Switch Boxes • Explosion-Proof Fittings • Reellets

FOR EVERY INDUSTRIAL, COMMERCIAL
OR RESIDENTIAL REQUIREMENT...
Sell the time-saving line...

LATROBE

FLOOR BOXES and WIRING SPECIALTIES

No. 330 LATROBE TOM THUMB UTILITY OUTLET



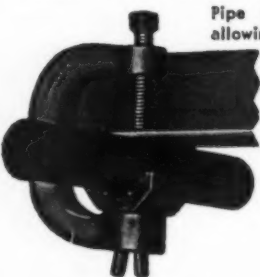
To be used in wood installations and other locations free from moisture or mechanical injury.

No. 130 ADJUSTABLE WATER TIGHT FLOOR BOX



No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Cover plate $3\frac{1}{2}$ " —overall height $3\frac{1}{2}$ ".

No. 470 PIPE OR CONDUIT HANGER



Pipe support turns freely, allowing pipe to run parallel or at right angles to beam. Does away with drilling or use of straps. Handles $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1" pipe to steel beams $\frac{3}{8}$ " thick.



No. 285 DOUBLE DUPLEX RECEPTACLE NOZZLE

The most attractive, compact, easy-to-install fitting on the market. Shown in the accompanying illustration with No. 200 Cover Plate.

To meet the expanding requirements of your buyers, sell the LATROBE LINE... It's complete in every detail, including floor boxes and wiring specialties adapted to commercial, industrial and residential jobs.

Aside from the fact that the LATROBE LINE is complete as to products, there are many other features that make their sale easier. First among these is the time-saving element. Each LATROBE item has been designed to decrease installation time... an important point to stress to contractors. Then, too, each LATROBE Floor Box or Wiring Specialty is flexible as to use... safe and long-lived in operation, and made of the best materials available.

So, stock the line that saves time... sell LATROBE wherever quality, useability and economy are the desired features. Write for our price and product list today... also a copy of our distributor plan.



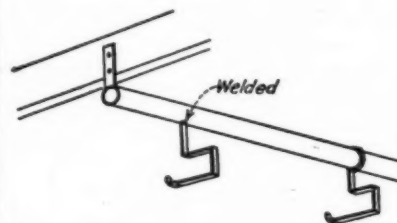
Write for details TODAY!

FULLMAN MANUFACTURING COMPANY
LATROBE • • • PENNSYLVANIA

WIRING Methods

[FROM PAGE 34]

for the company's cars and trucks, to load and unload, or park off of the street. In a corner of the yard is a shed for temporary storage of heavy stuff used on construction. The rafters of this low shed provided Dan Bronson, manager, with an idea for storing the ladders. The method is convenient and space saving and could be used in any kind of storage room.



SUPPORTS for the ladders are made in a square hook, one fixed, the other movable.

Pipe racks are fastened to the ceiling joists by means of welded straps. The pipes, in parallel, clear the joists by an inch or two. Near one end is welded a fixed square hook (as illustrated). Sliding freely so as to be adjusted to any length ladder is another such hook, made of heavy iron rod. Two ladders can be hung from each pair of hooks. A ladder is hooked first over the sliding hook, pushed along and lifted to the fixed hook. Removing is just as easy. They are off the ground, out of the way, always handy.

GREASE COATED SWITCHBOARDS

During the installation of an electrical job, the Hixon Electric Co., electrical contractors and engineers of Boston, Mass., covers all main switchboards with a fairly thick coating of ordinary axle grease.

This protective coating is placed on the boards to prevent paint, plaster and other things, which invariably are dropped during a construction job, from sticking to the finish of the boards. The grease and all the dirt that might be with it is easily wiped off with a soft cloth and possibly a little kerosene if the grease is too thick. A final rubbing with a clean soft cloth leaves the finish in a clean polished condition. It is no longer necessary for this contractor to scrape and repaint switchboards that have been damaged by careless painters and plasterers.

LAMPS... THE WAR ...AND YOU!

MORE and more plants are working the night shift; big plants—little plants. They are going to need more light than ever before—and many of them—smaller plants particularly—are perhaps depending upon you, as a G-E MAZDA lamp contractor-dealer, to supply them with their increased lamp needs—lamps needed to help win the war. Light is playing an important part in this war—by increasing production, saving time and energy, and aiding health and morale. America, best lighted nation in the world, is using this light to help make planes, tanks, ships, guns... faster... faster.

WAR PUTS EXTRA BURDEN ON EYES

There will be homes where a lot of extra eye work will be done... extra studying... sewing... overtime war work. They will be looking to you for their supply of G-E MAZDA lamps.

You have an opportunity to help in the distribution of lamps where they will do the most good... to help see that they are used wisely, parti-

cularly in those places where eyes are at work helping to win the war. It's time, more than ever, to make sure you recommend the right-size bulbs—in factories—in offices—and in homes—where light is really important.

HOW TO GET MORE OUT OF LIGHT

Regardless of whether used in the home, store, office or factory—bulbs and lighting equipment *do* get dirty. Such a condition often wastes as much as 50% of the light. Remind your customers that frequent use of soap and water will do wonders in maintaining lighting efficiency... in helping them get full lighting value for their money.

Every contractor-dealer can do his part by seeing that the most effective use is made of existing lighting equipment as well as by making sure that G-E MAZDA lamps are distributed where they are needed most. Such service... such cooperation will do its full share in helping win the war... and win this war we must! General Electric Company, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS
GENERAL  ELECTRIC



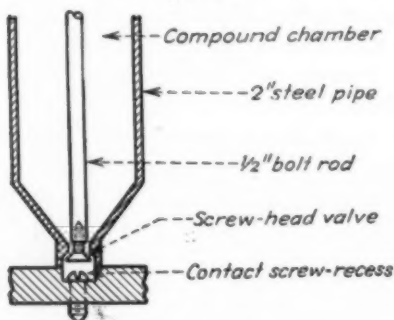
Motor Shops

COMPOUND DISPENSER

The Central Armature Works, Washington, D. C., had occasion to fill, with sealing compound, a large number of contact and screw holes on switch and contactor mounting bases used in their electrical construction business. So,



SPOT SEALING of contact screw recesses is simplified and speeded up by the use of this compound dispenser. Electric or flame heat may be applied to cylinder.



VALVE DETAIL showing construction of routed out nozzle and screw-head valve which regulates the flow of the sealing compound.

Walter Bailey, shop foreman, designed and built a simple compound dispenser to speed up the job.

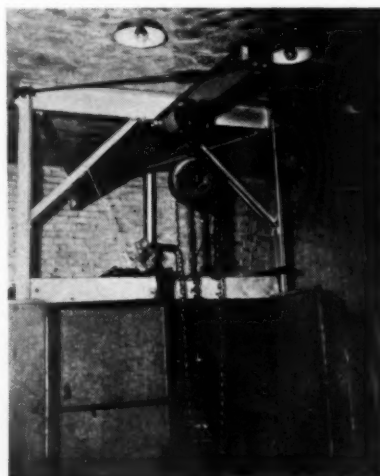
The device consists of a 2-inch steel pipe container with a funnel shaped nozzle on the bottom. This container is supported by an L-shaped flat iron bracket which slides along a vertical

1/2-inch bolt rod about 12-inches long. The top of this rod is welded to a flat iron and angle iron bracket which fits into an ordinary machinist's vise. The bottom of the rod is drilled and tapped for a flat head screw which forms the cut-off valve in the funnel nozzle. The nozzle is routed out to form a seat for the screw-head valve.

When the compound is heated in the dispenser by a torch or electric heater, the container slides freely on the vertical rod. Pressing the screw cavity against the nozzle raises the dispenser and opens the valve. When this pressure is released, the container drops and closes the valve. With the use of this handy device, one mechanic filled 7,000 screw cavities in approximately three hours.

OVEN HOIST

Moving heavy equipment in and out of this large bake oven at the Electrical Engineering and Service, Inc., shop at Westfield, Mass., is no problem. The reason—they installed a chain hoist directly above the oven.



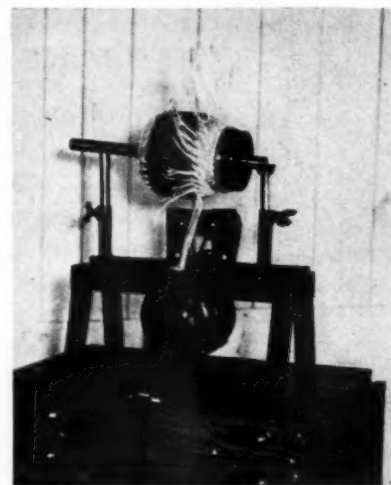
DRUDGERY ELIMINATED. This oven hoist makes handling heavy equipment a pleasure in this motor shop. A yank on the chain—a push on the trolley—and the motor is in the oven

A sturdy iron framework supports a long I beam on which the hoist travels. This beam extends well beyond the front of the oven to permit the equipment to be dipped in the portable dipping tanks, then rolled into the oven to be baked. When the hoist is out of the oven, a cover is placed over the opening in the top of the oven to keep the heat in. Much non-productive labor and muscle straining are eliminated by this simple mechanism.

ARMATURE LEAD STRIPPER

Rewound armature leads are quickly stripped of their insulation on this simple device developed by the motor repair department of A. L. Brown Associates, Inc., Worcester, Mass.

The unit is supported by an inverted V-shaped angle and channel iron frame-



STRIPPING LEADS of rewound armatures is simplified by the use of this wire brush stripping mechanism developed by a Worcester, Mass., motor repair shop.

work with a horizontal cross piece. Mounted on top of this cross bar are two steel brushes which revolve in opposite directions in a vertical plane. They are driven by a motor mounted on the under side of the horizontal bar.

The armature is supported by V-shaped slots in steel pins. These adjustable pins telescope into vertical conduit nipples welded to a channel mounted on the horizontal support. Thumb type set screws hold the pins rigidly at any desired height. For smaller armatures or those with short shafts, the supporting pins are equipped with longer pieces of angle iron to form the V slot.

To strip the leads, the armature is placed on the support and slowly revolved as each group of leads is skinned by the revolving brushes. The unit has sufficient weight so it need not be bolted down, giving it some portability.



DEFENSE HOUSING

Calls for Conservation

**AND THE USE OF PORCELAIN
SAFER NON-CRITICAL WIRING MATERIALS**



• See Defense Housing Critical List dated February 24, 1942

• See War Department Circular Letter #1245 dated February 21, 1942

BULLETIN

War Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for war effort.

Defense Housing as well as all other Federal and private construction calls for every possible saving of critical materials and

substitution with less critical materials to assure Victory for our War Effort. With this in mind the War Department and the War Production Board have issued proclamations stating which materials must be eliminated from general use with suggestions for their replacement.

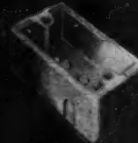
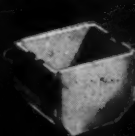
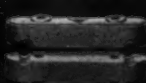
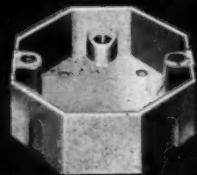
PORCELAIN PROTECTED WIRING SYS-

TEMS and the materials for their installations—Porcelain Outlet Boxes, Knobs, Tubes, Cleats, etc., are specified to con-

serve critically needed Copper, Rubber, Steel, Zinc, and other materials.

There is no scarcity of the raw materials from which porcelain wiring devices are made. Materials for Modern Porcelain Protected Wiring Systems may be obtained through your wholesaler and are manufactured by the companies listed below.

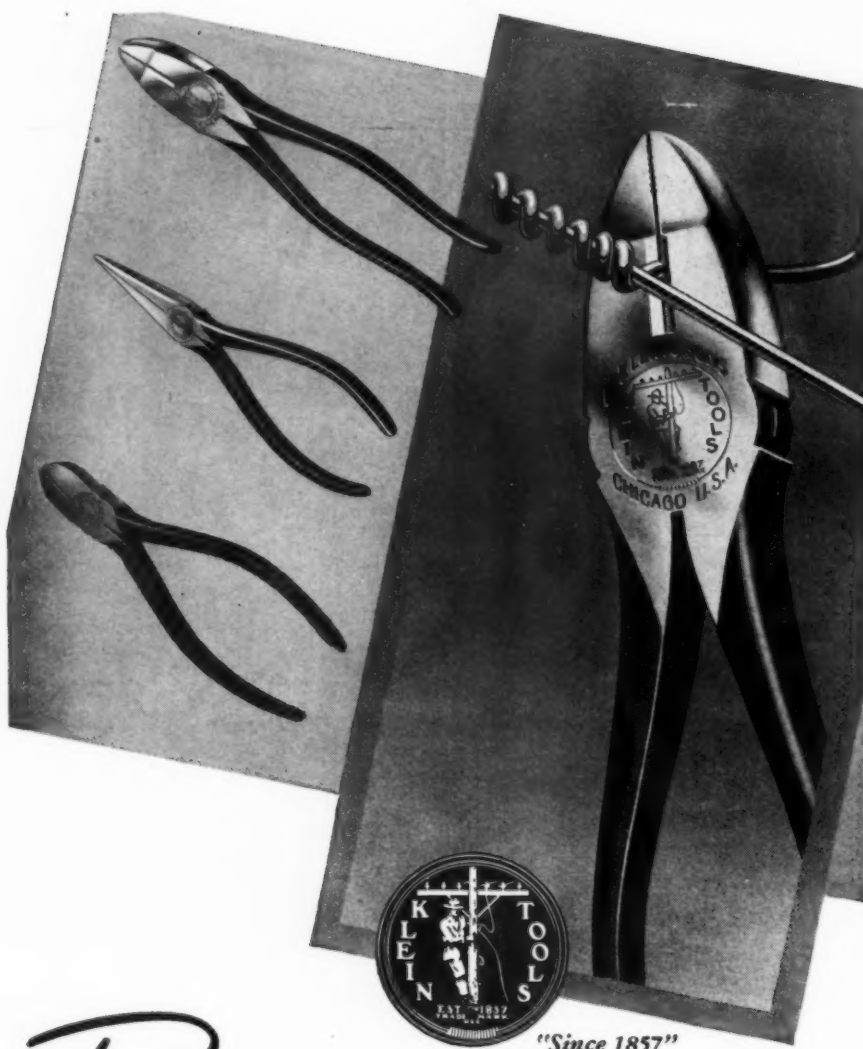
MODERN PORCELAIN PROTECTED WIRING SYSTEMS



★ ILLINOIS ELECTRIC PORCELAIN CO.
Macomb, Ill.

★ KNOX PORCELAIN CORPORATION
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED
Findlay, Ohio



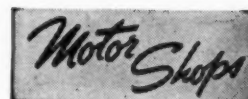
Better Made **FOR THE MAN WHO KNOWS GOOD TOOLS—KLEIN**

Look in the hands of the man who knows good pliers—you probably will find that he uses Klein's. Almost a century of manufacturing experience is back of every pair of Klein pliers—almost a century of "know how" that has won for Klein's their reputation for reliability when the going is tough.

Klein pliers are made in a variety of sizes and styles to suit every electrical need. In the Army, Navy and on priority jobs they are assuring better work—faster work.

ASK YOUR SUPPLIER—Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 **Chicago, Ill., U.S.A.**
1200 BELMONT AVENUE, CHICAGO



[FROM PAGE 38]

SECOND FLOOR REEL RACK

Valuable space is saved at the motor repair shop of the J & H Electric Company, Providence, R. I., by keeping the stock of magnet wire on the second floor stock room. Although the winding department is on the first floor, the reel



VERTICAL RACK on second floor stock room supports reels feeding magnet wire to the motor winding department on the first floor of this Providence, R. I. repair shop. More space is thus provided for machinery in the winding department.

rack feeding the winding machines is on the second floor adjacent to the magnet wire stock.

The rack is made of angle iron and is mounted to the stock room shelves and floor. It tapers off as it reaches the ceiling. Angle iron cross pieces on the triangular framework support a total of six reels. The supporting reel rod has a leather washer friction device to prevent the magnet wire from unwinding too fast. The wire passes over smooth, bearing mounted wooden rollers and goes through an opening in the floor to the winding department below. The wire tension device for the winding machine is located adjacent to it on the first floor.

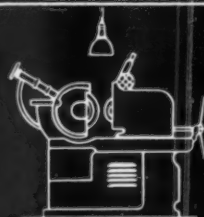
SHAFT EXTENSION

One of the repair problems encountered by the A. W. White Co. of Oklahoma City in serving oil field motors is shaft extension. Breakage under the exceptionally severe service of well drilling is common and this concern has per-



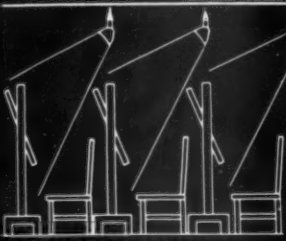
BENJAMIN RLM DOME

The most widely used of all industrial lighting units for general industrial lighting; efficient, life-time durability, quickly installed, low cost, conforms or exceeds all RLM Specifications.



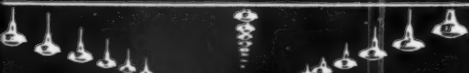
BENJAMIN RLM BOWL

Widely used for localized lighting where moderate levels of supplementary light are required over large areas of machine or bench for fine seeing at 50 to 100 footcandles.



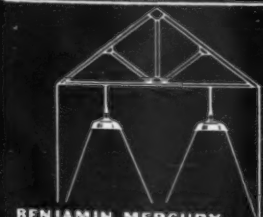
BENJAMIN ELLIPTICAL ANGLE

For vertical surface lighting of inspection frames and sides of long machines and for rooms where side lighting is necessary because of ceiling obstructions.



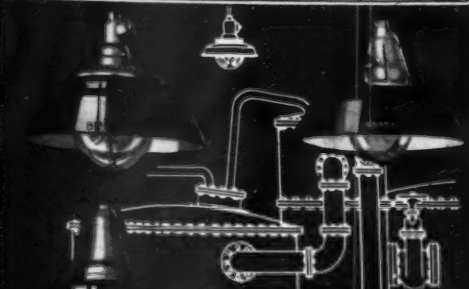
BENJAMIN GLASSTEEL DIFFUSER

Combines opal glass globe and porcelain enamel reflector for soft, glareless, general illumination of exceptional quality.



BENJAMIN MERCURY LAMP UNIT

For efficient high-level lighting; makes possible greatly increased lighting levels without rewiring; often indicated as best solution for high bay lighting.



BENJAMIN EXPLOSION-PROOF, DUST-TIGHT AND VAPOR-TIGHT UNITS



Are YOU Faced with One or More of These Lighting Problems?

Immediate Lighting Problems Facing Industrial and Ordnance Plants Can Be Solved

Today, as never before, management must utilize lighting as a production tool to solve the pressing problems of increased output, maintenance of precision standards, plant conversion, space conservation, hazardous locations, and employee efficiency and morale. The lighting problems involved are many, but whatever they are, and however they may be complicated by the problems of cost, installation deadlines and the unavailability of certain types of lighting units, there is a way to solve each and every one of them. In this, Benjamin specifications for Productive Lighting will be found invaluable.

Forty Years of Experience At Your Service

Benjamin Specifications for Productive Lighting represent the cumulative knowledge and experience gained through forty years of specialization in productive lighting for Industry. They include all types of lighting . . . fluorescent, incandescent and mercury lamp and every type of unit found essential to the solution of the seeing, and installation problems involved in the many phases of industrial operation.

Lighting Essentials Need Not and Must Not Be Sacrificed!

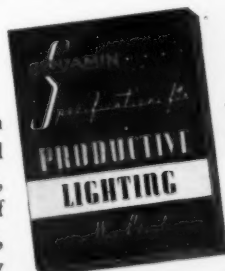
Benjamin equipment can be depended upon to meet these four essentials of Industrial Lighting: 1. *Highest practical light output*, essential to economy and conservation of power. 2. *Correct design and reflection qualities*, essential to providing light that is properly

diffused to eliminate excessive contrast conditions, harsh and dark shadows and excessive direct and reflected glare. 3. *Porcelain enamel reflecting surface*, essential to maintenance of original lighting efficiency. The porcelain enamel reflecting surface used in Benjamin units has proven through the years to be the most efficient and practical for industrial lighting purposes. It cannot corrode, oxidize or tarnish. Soap and water quickly restores it to its original high reflection efficiency. No other commercially available type of light reflecting surface of equal diffusing quality can equal its high reflection factor . . . its efficiency in providing the maximum light output of diffused light. 4. *An Extra Safety Factor of Strength and Durability*, essential to withstand the stresses and strains and atmospheric conditions of continuous day and night industrial operation.

Send for Free Copy of Benjamin Specifications for Productive Lighting

In this booklet are contained specific examples of how the application of Benjamin Specifications for factory lighting can solve specific lighting problems, such as are briefly described in the left-hand column. Reading this book will give you a clearer insight on how Benjamin Specifications for

Productive Lighting can solve your specific lighting problems. For your complimentary copy, sent without cost or obligation, address the Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.



BENJAMIN

WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALEERS

TURN THE NIGHT SHIFTS INTO DAY THE WHEELER FLUORESCENT WAY



INSTALLATION
WHEELER NO. 4925 "DAY-FLO"
FLUORESCENT UNITS

WHEELER "DAY-FLO" FLUORESCENT UNITS GIVE THIS PLANT 50 FOOTCANDLES OF "PRODUCTION BOOSTING" DAYLIGHT ILLUMINATION

One of the surest, quickest and most economical ways to keep production levels uniform is by providing more and better light.

Good lighting is a major production tool. It enables workers to see clearly and easily at all hours — day and night. It helps eliminate accidents, eye-strain, fatigue, rejects and other factors that result in production slow-downs.

The unretouched night photograph shown above, was taken in the Assembly and Final Inspection Department of a large manufacturer. Wheeler "Day-Flo" Fluorescent Units provide an average illumination of 50 footcandles on the working plane — abundant illumination for workers to see easily at all times.

There are types and styles of Wheeler Fluorescent Units to meet practically any industrial lighting requirement. Wheeler engineers are available to assist you in recommending and planning a good lighting system.

WRITE FOR COPY OF NEW BULLETIN "WHEELER FLUORESCENT LIGHTING EQUIPMENT"

Distributed Exclusively Through
Electrical Wholesalers. Manu-
facturers of Lighting Equipment
Since 1881.

Manufacturers of Lighting Equipment Since 1881

WHEELER
REFLECTOR COMPANY
275 CONGRESS ST., BOSTON, MASS.

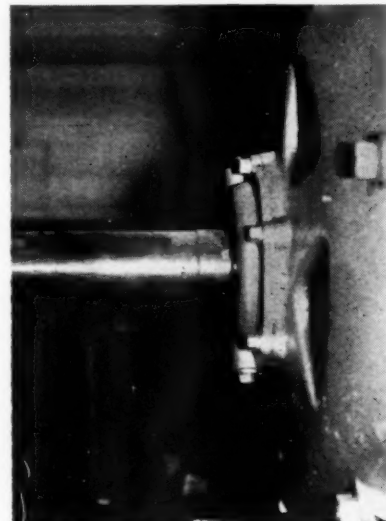
NEW YORK - CLEVELAND - REPRESENTATIVES IN PRINCIPAL CITIES.

Motor Shops

[FROM PAGE 40]

fect a technique which makes a quick and strong repair.

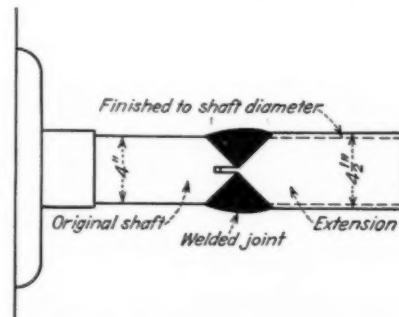
The broken shaft is beveled to 45 deg. and a $\frac{3}{8}$ -in. hole drilled to a depth of about 1-in. at the center. The shaft extension is similarly prepared from a piece about $\frac{1}{2}$ -inch larger in diameter



SHAFT REPAIRS by welding and careful machine work extended this 4-inch shaft on a 200 hp. motor 8 inches for a direct connected drive.

than the broken shaft. A close fitting pin holds the new extension to the shaft.

Electric welding with No. 5 Fleetweld rod is used to build up to joint to a diameter larger than the extension.

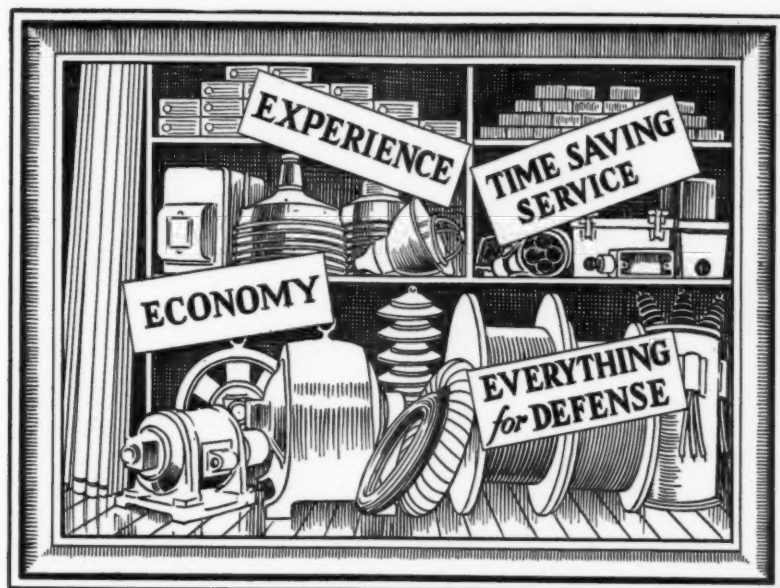


WELDED JOINT and oversize extension are trimmed down to shaft size. Ultimate strength of joint is equal to original shaft with good welding.

The assembly is then cut down on a lathe to the diameter of the original shaft.

Careful welding and machine work makes a joint that has the full strength of the shaft. Expert workmanship is essential, however, as equipment used in oil field service is subject to very severe use and must be able to stand up.

Electrical Contracting, April 1942



~ the bright side of the picture

Electrical products essential for War are pouring out from thousands of plants in almost unbelievable volume.

Very much in the picture are the stockpiles and services of the Electrical Wholesaler who realizes that his existence depends upon our winning the war. He is of especial value to War Contractors who know what they want, but not exactly where or how best to get it at once.

The picture is brighter because the Electrical Wholesaler is enlisted on the Production Front—serving as regional clearing house for products, as well as giving technical information and interpreting Priorities rulings.

Said bluntly, he is bringing system and order to the distribution of electrical products, which otherwise, under war pressures, might easily degenerate into a disorganized hectic scramble.

We speak up for the Electrical Wholesaler because it would be so difficult for us to distribute our products without him.



THE THOMAS & BETTS CO.

INCORPORATED

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N. J.

Modern Lighting

COMBINATION LIGHTING

Mercury and filament combinations have been quite extensively used, especially in the lighting of high-bay areas, although for many types of work they can be used at low mountings.

There is a two-fold reason for recommending the combination system. First



DEFENSE LIGHTING with combination mercury and filament lamps provides 42 foot-candles of illumination in this plant.

is the matter of color quality. The combination of the blue-green light of the mercury lamp with the warmer color of the filament lamps results in a pleasing color that gives the effect of daylight. For the best appearance of colors under this synthetic daylight, equal quantities of light from the Type H mercury lamps and the filament lamps are recommended. Where color is not a factor then equal wattages are entirely satisfactory.

The second reason for the combination system is that of continuity of service. If there is an occasional interruption of electric service, or if there are wide fluctuations in voltage, both of which would cause the mercury lamp to go out, work could still be carried on during the seven minutes required for the 400-watt mercury lamp to restart.

The photo shows an excellent example of a combination system of filament and mercury lamps on an alternate staggered arrangement in a large eastern defense industry. Each outlet has one 1000-watt bi-post base filament lamp and two 400-watt Type H mercury lamps. The units are on 20 by 16½ foot spacings and mounted 44 feet above the floor. The average illumination is 42 foot-candles.

LIGHT FOR SELLING

Walker's Market on Arnett Blvd., Rochester uses a lighting system with a high direct component to punch light on to the merchandise and thus focus attention on the different packaged material placed in the open type displays.

The units used are the Curtis Directors. These are equipped with 300-watt lamps and located on 7- by 8-foot



ADDED SALES PUNCH is given merchandise in this market by the direct down light component from the incandescent ceiling fixtures. Recessed units are used over wall shelves.

centers to provide 35 foot-candles of general lighting.

Recessed units are also employed to put light on to the shelving seen in the left background of the illustration. These units are on 3½ foot centers 3 feet from the shelving.

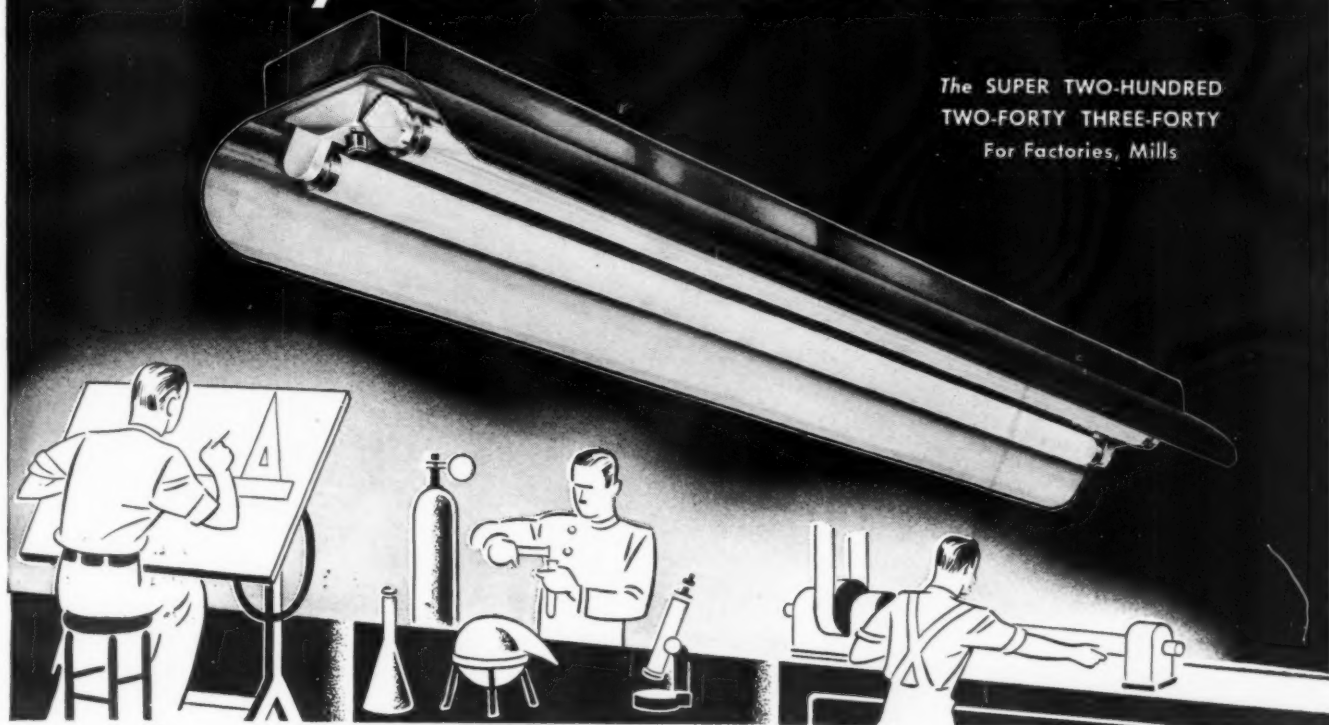
FLUORESCENT LIGHTS AT WOOLWORTH'S

The Woolworth store, in Detroit, Mich., is completely lighted with fluorescent lighting. The entire basement, first and second floors are uniformly illuminated by over 3,000 ft. of continuous rows of fluorescent fixtures to a level of from 60 to 75 footcandles. A



FLUORESCENT TROFFERS, suspended from the ceiling, light this busy drafting room and office to an approximate intensity of 50 foot-candles. The Miller units are single tube 40-watt sections coupled end to end in continuous rows spaced on 3½-foot centers. The mounting height is 8 feet.

With Day-Brite Fluorescent Fixtures...



The SUPER TWO-HUNDRED
TWO-FORTY THREE-FORTY
For Factories, Mills

...There's Always "Day-Light" on the Job!



The KINGSWAY
For General Offices



The LITEWAY
For Engineering Depts.,
Offices, Drafting Rooms

LIGHT is by all odds the most vital "tool" in the Victory Production Line... Therefore — get the most effective value out of fluorescent — keep "daylight" on the job — with Day-Brite Fixtures correctly designed for specific applications!

From plans to production, there's a Day-Brite Fluorescent Fixture that will help you maintain more accurate control of production... guard against avoidable waste and rejects... smooth out and speed up the flow of work... help lift morale that's often dragged down by poor visibility... minimize eye strain... reduce fatigue... *and make every hour count on every job you do!*

DAY-BRITE LIGHTING, INC., 5436 Bulwer Ave., St. Louis, Mo.

Call Your Day-Brite Representative

Whatever your light requirements may be, Day-Brite can meet them adequately, quickly... Call the Day-Brite Engineering Representative near you—he is qualified by long experience to recommend the Day-Brite Fixtures that will definitely give you the fluorescent efficiency you need.



A New Catalog Covering
**THE COMPLETE LINE OF
FLUORESCENT LIGHTING FIXTURES**
IS NOW AVAILABLE
Nationally distributed through all
leading electrical supply houses.



For Quality and Delivery...



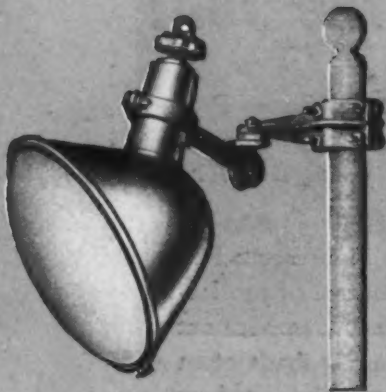
70,000 sq. ft. OF FLOOR SPACE
DEDICATED TO THE PRODUCTION
OF THE ALL-INCLUSIVE LINE OF
SPERO QUALITY ELECTRICAL PRODUCTS

REFLECTORS • FLUORESCENT LIGHTING FLOODLITES • VAPOR PROOF UNITS ELECTRICAL CONSTRUCTION MATERIALS

The Spero Electric Corporation has dedicated its plant and its men to making a steadily increasing volume of electrical products for a myriad of contractor needs.

For more than 30 years, the SPERO line has served the needs of industrial and commercial establishments well. During these years, the requirements of the users have influenced the design and workmanship of every SPERO item. Today the SPERO lines cover every standard need in their respective fields. These products are built to high standards and for lasting performance. Our large plant at Cleveland is geared to produce in anticipation of your demands.

With delivery all-important, you can't afford to shop around. Depend on SPERO as a complete source of supply on five lines of electrical equipment. For quality and delivery, quote SPERO.



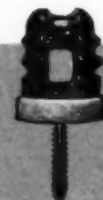
Floodlights — to stop the sunbaker — many different types for regular or special installations.



A complete selection of incandescent reflectors and fittings — all types and sizes.



Vapor Proof units — 3 types with or without reflectors or guards.



Materials and fittings for electrical construction of standard and special design.

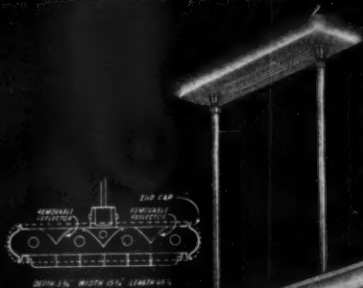


THE SPERO ELECTRIC CORPORATION

18222 LANKEN AVENUE ★ CLEVELAND, OHIO

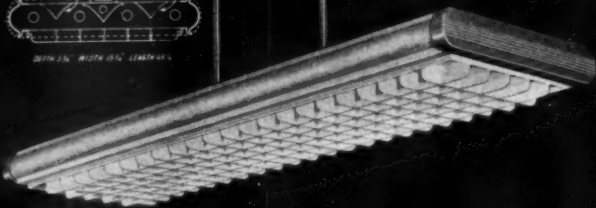
Quote SPERO

FIVE LINES OF PRODUCTS FROM ONE DEPENDABLE SOURCE



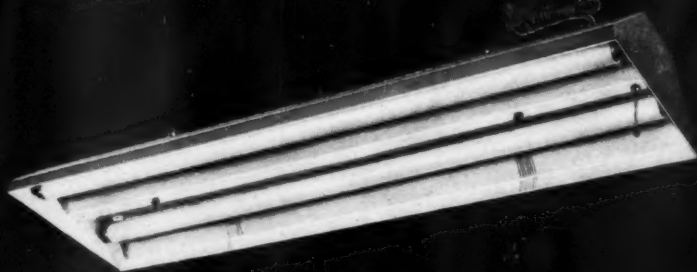
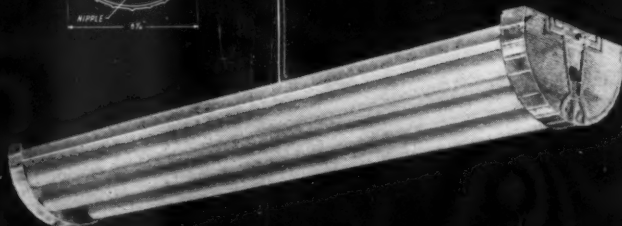
LVR 448

A three way unit (open, glass diffuser, egg crate diffuser) for general illumination. Removable reflectors for simplified relamping. Plastic side panels and other outstanding features make this a highly efficient, attractive four tube fixture.



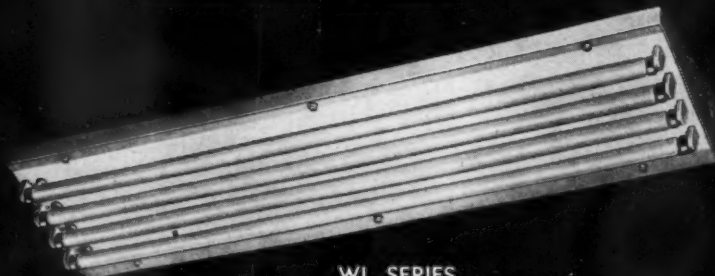
CUP SERIES

Efficient open type general illumination fixture. Plastic ends, reflecting surface for every tube, one stem swivel type construction for self alignment. Furnished in 424, 248, 448 sizes. Reflecting surfaces finished "Plastox" white.



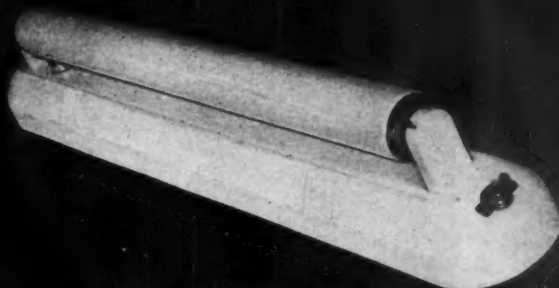
RU 248 AND 260 SERIES

Two units designed to meet exacting demands of high intensity industrial lighting. Individual reflectors give more efficiency per lamp per unit. Reflecting surfaces finished "Plastox" white. Adjustable hanging bracket, cord and plug, pull chain socket furnished standard.



WL SERIES

This unit is engineered for window lighting. Designed to give a complete spill of light over entire window with added light at the display planes because of focusing angle of reflector. Furnished in 8 sizes. Finished in "Plastox" white.



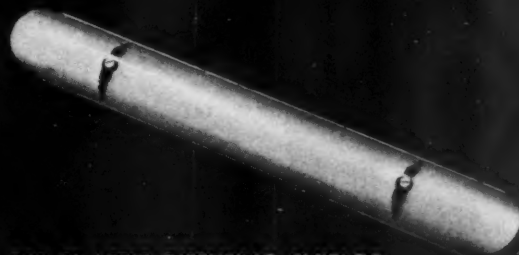
B SERIES BRACKETS

Attractive streamlined round end wall bracket. Finished either chrome or "Plastox" white. Convenience outlet furnished on request. Furnished in 18" and 24". RSP Plastic Diffusing Shields may be used with these brackets.



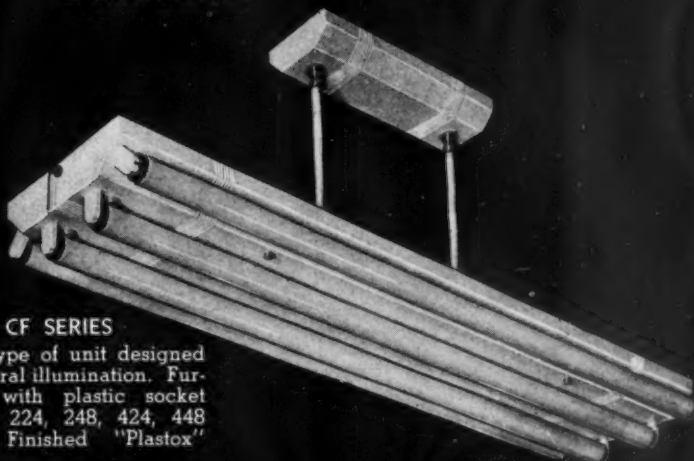
S SERIES CHANNEL

Gangable channel furnished wired or unwired. Sockets and reactors mounted on the cover plate. Also furnished with symmetric (SR) and asymmetric (SA) reflectors. (Not gangable.) Finished in "Plastox" white.



RSP PLASTIC DIFFUSING SHIELDS

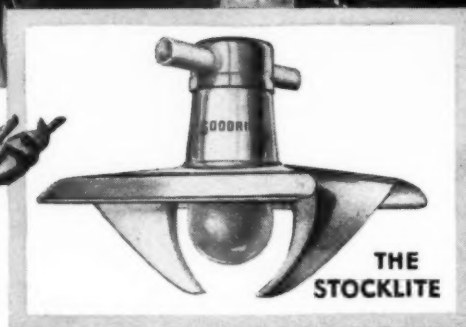
A practical inexpensive solution to glare and decoration problems. Furnished in red, blue, green, yellow, and white for T-8 or T-12 tubes. 18-24-36-48 lengths.



CF SERIES

Direct type of unit designed for general illumination. Furnished with plastic socket caps in 224, 248, 424, 448 sizes. Finished "Plastox" white.

WAR-TIME STOCKROOMS NEED THIS *special fixture*



● Today's rush orders for Victory require fast, accurate handling. To accomplish this, use the fixture *correctly designed* for the illumination of stockroom shelves and bin interiors. The Stocklite will help you speed up, save time, and avoid costly mistakes. Note how its novel design protects you from glare and eyestrain, yet throws light into bins from top to bottom row where ordinary fixtures cannot. The Stocklite is widely used by the Government and defense plants. Write for Bulletin No. 91.

GOODRICH
INDUSTRIAL LIGHTING



In addition to approved RLM fixtures, the complete Goodrich line includes a size and style of fixture for every industrial requirement.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

Modern Lighting

[FROM PAGE 44]

bright and cheerful appearance is prevalent throughout the store, due to light colored walls, ceilings and floors. The brightness of the ceiling between the continuous rows of fixtures averages 22 foot lamberts, while the wall brightness varies between 27-37 foot lamberts. The average illumination on a vertical plane at counter height is equal to 40 foot-candles.

The lighting units, arranged in con-



CONTINUOUS ROWS of fluorescent fixtures in this Woolworth's store produces from 60 to 75 footcandles.

tinuous sections up to 88 ft. in length are Barkon-Frink 7,000 series direct type mounted on the ceiling. Each unit contains three 40-watt, 3500° K mazda F lamps, wired so that three levels of illumination are obtainable. The fixture is completely enclosed with hinged panels to allow for easy maintenance. The total watts per square foot, including auxiliary loss is 3.6.

FOOT-CANDLES FOR SELLING

Fluorescent lighting has proved particularly popular for men's wear stores. Since merchandise is predominantly dark and has such subtle differences in color and pattern, high foot-candles of the right quality are necessary for good merchandise presentation and customer satisfaction.

The photograph shows what is probably one of the best lighted men's shops in the country. It is the J. L. Hickey store in Detroit, Michigan. The section shown is lighted by a troffer system equipped with three rows of 48-inch white fluorescent lamps, suitably louvered to eliminate any possibility of direct glare from the lamps. Indirect

Electrical Contracting, April 1942



Answers to 17 questions most frequently asked about FLUORESCENT LIGHTING EQUIPMENT

Never before have we been asked so many questions by electrical contractors, and these three facts would seem to explain their growing interest in fluorescent lighting equipment.

1. The many exaggerated claims being made about fluorescent lighting and equipment in general.
2. The greater cost of fluorescent over filament equipment, making lighting today a major purchase.
3. The extreme importance of higher illumination in the war effort.

It seems timely, therefore, to answer the more frequent questions in this REPORT TO ELECTRICAL CONTRACTORS.

Is there any one best kind of industrial lighting? Yes, continuous-row fluorescent lighting is proclaimed "the new standard for industry" by lighting authorities.

Is there any one best continuous-row lighting system? We think MILLER 50 FOOT CANDLER, 100 FOOT CANDLER and MILLER TROFFERS are measurably superior to any other equipment on the market today. The MILLER System was the *original* continuous-row lighting system.

When were the first MILLER installations made? MILLER Fluorescent Systems have been in use since January, 1940.

How many installations have been made? Over 135 miles of MILLER Fluorescent Lighting Systems are in use.

In what kinds of plants? In armories, arsenals, airplane and parts plants, in the factories of all types of *offense* suppliers.

What kind of deliveries are you making? Deliveries are moving smoothly, fast and ahead of building schedules *as a rule*. And no major installation goes in without a MILLER engineer on the job.

What about priorities? We like many other manufacturers are dependent on material

allocation. We are cooperating 100 percent with the war program.

Are you biased in favor of fluorescent? No. MILLER offers a complete line of fluorescent and filament lighting equipment for every commercial and industrial need.

What is the significance of the names 50 FOOT CANDLER and 100 FOOT CANDLER?

The 50 FOOT CANDLER, using 40-watt Mazda F lamps, is designed to provide a minimum of 50 foot candles of illumination, and the 100 FOOT CANDLER, using 100-watt Mazda F lamps, a minimum of 100 foot candles when mounted and spaced on centers prevailing in the average plant.

Are MILLER Lighting Systems priced low, medium or high? A direct comparison of "fixture cost" is not possible because these units are more than a "fixture" for they provide a complete lighting system, wireway channels, auxiliaries, wire and reflectors, making possible savings of from 30 to 50% in the cost of installation.

Are 50 FOOT CANDLERS and 100 FOOT CANDLERS suitable for lighting offices, drafting rooms, and similar locations? They are, but MILLER TROFFERS, *Continuous Recessed* Fluorescent Lighting System, are recommended for use with acoustical or other hung ceiling constructions. More than 25 miles of MILLER TROFFERS are in service today.

Any "bugs" to be eliminated from these 3 lighting systems? No. They carry MILLER's guarantee, and have been

proven by more than two years' intensive service in manufacturing and war plants of all kinds.

What do you mean "Guaranteed"? Each fixture comprising either of these lighting systems carries a written guarantee backed by The Miller Company's 98 years of specialization in lighting equipment.

Have you any actual figures on increased production with MILLER 50 FOOT CANDLERS?

In one group of textile mills, for example, where accurate records were kept, MILLER 50 FOOT CANDLERS are credited with (1) Increase in weaving efficiency from 81% to 84%, with a decrease of 22% in mending costs; (2) Increase of weaving efficiency from 83% to 87.7% with a decrease of 25% in mending costs.

What about maintenance? Simple in the extreme. The porcelain-enameled reflectors are easy to remove and clean.

What of the future? Any plant can be rearranged, or laid out for entirely different work without touching the MILLER Lighting System. Should you want greater illumination, you can get up to 45% more without adding new fixtures.

How do we go about getting complete specifications on the MILLER Continuous Fluorescent Lighting System? Wire The Miller Company direct, at Meriden, Conn., or phone our nearest representative.

MILLER

**50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS**

Continuous Wireway Fluorescent
Lighting Systems



THE MILLER COMPANY
MERIDEN, CONN.

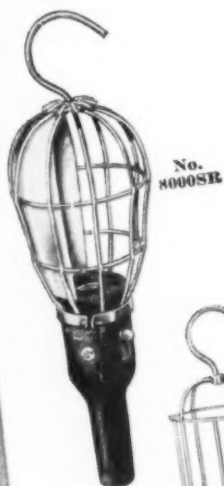
Pioneers in Good Lighting Since 1844

• MILLER offers a complete line of filament and fluorescent lighting equipment

WOOD does the Job

Rubber now is on the critical list which means that MCGILL all-purpose wood handle guards will be used in affording protection in heavy-duty, high-pressure war industries . . . Over the years many large plants have found MCGILL wood handle guards give complete satisfaction, because they're durable, wash easily, wear well in grease and oil. When you want portable guards, order MCGILL wood handle guards. There is a type to fit every requirement.

Visit your wholesaler or write us for additional information.



Electrical
Division

MCGILL

MANUFACTURING COMPANY
VALPARAISO, INDIANA

Modern
Lighting

[FROM PAGE 48]

pendant units are equipped with two rows of white lamps.

The foot-candles range from 120 directly under the troffer unit, which is the real point of sale, to 50 foot-candles in the other areas.

In the left background are the pajama and shirt displays. The pajama sign is easily seen from a distance and thus customer service is expedited. The cove lighting of course serves the further function of illuminating the ceiling in this area. The lamps used are 40-watt white mazda fluorescents.



COLOR CONTRAST in clothing is highlighted by the fluorescent lighting in this Detroit men's shop. Indirect and cove units provide ceiling illumination.

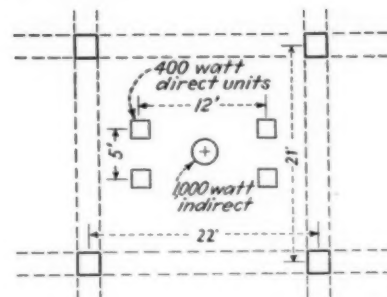
Lighting a CLOTHING STORE Incandescent

PROBLEM—To provide adequate illumination of proper quality for effective merchandising of men's clothing.

CONSTRUCTION DATA—The main floor is approximately 80 by 100 feet with column bays about 21 by 22 feet. The ceiling, 16 feet high, is finished in flat light cream.

SOLUTION OF PROBLEM—The area is lighted by a combination of direct and indirect incandescent lighting. In each bay are four direct units, surface mounted with four 100-watt reflectors and 8-inch lenses in each. These units are supplemented by a 1000 watt indirect luminaire in each bay.

RESULTS—An average of 45 foot-candles of illumination is provided at counter height after four months' operation. The load is 2600-watts per bay.



LAYOUT PLAN shows the spacing of ceiling units and indirect suspended luminaires.



DIRECT-INDIRECT lighting combination produces 45 foot-candles at counter height

RECOMMEND **X-Ray** SILVER MIRROR REFLECTORS FOR ACCURATE LIGHT CONTROL IN WAR INDUSTRIES

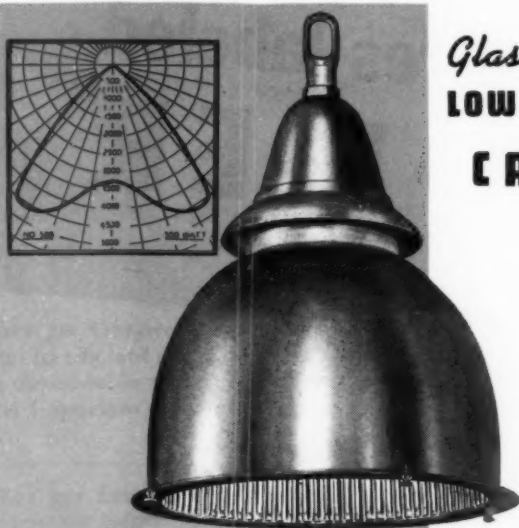


Glass Reflecting Surfaces
LOW MAINTENANCE COST

CAT. NO. 1588—"ATLAS"

for 300 or 500 WATT LAMPS
ALSO 400 WATT MERCURY VAPOR LAMP

The "X-Ray" reflector incorporated in this unit is one of the finest ever designed for general lighting. It will enable you to do a first-class lighting job. (See distribution curve.) Also available less steel housing: Cat. No. 588.



**ALWAYS A LEADER
IN THE GLASS
REFLECTOR FIELD**

X-Ray

Glass is a non-scarce material readily available in a period when other materials are necessarily restricted. "X-Ray" Silver Mirror Reflectors are the finest glass reflectors made. They are backed with pure silver for high efficiency and protected with the famous Golden Armor backing.

CAT. NO. 590—"BIG BOY"

for 750—1000—1500 WATT LAMPS

No. 590 is giant size (20") reflector for use in high bays. This reflector is also available with a metal housing similar to Cat. No. 1588 illustrated above: Cat. No. 1590.

CURTIS ENGINEERING SERVICE

Our factory engineers and our field representatives are ready to help you with your industrial lighting problems. Write today for information on X-Ray industrial lighting.



CURTIS LIGHTING, INC.

6135 WEST 65TH STREET... CHICAGO

Why you give your customers

Extra Value

with fixtures labeled

FLEUR-O-LIER



Fluorescent lighting has become a vital tool in wartime production. Therefore, it's doubly important to sell the RIGHT equipment.



FLEUR-O-LIERS

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer

FOLLOW THIS FLEUR-O-LIER GUIDE TO *Extra Value* IN FLUORESCENT LIGHTING

WHAT CUSTOMERS GET

They get fluorescent lighting fixtures made to fifty definite specifications set up by MAZDA lamp manufacturers to assure top-notch performance and service. These cover fixtures, starters and ballasts.

1

Fixtures built to definite standards

WHAT IT MEANS TO THEM

This label means assurance of high quality equipment . . . built to serve dependably for the long pull ahead; and it means getting the most from their lamps.

2

Testing and certification

They get fixtures certified as meeting these important specifications by thorough test of impartial experts . . . famous Electrical Testing Laboratories, New York.

This label saves time for their purchasing department. Tests you might expect them to make have already been made by independent experts.

3

Certified ballasts and starters

They get *Certified* ballasts and starters—vital to efficient operation. No fixture can be dependable without positive check on this important control equipment.

This label means efficient operation and efficient use of the wiring system. This is especially important with today's demand on electric power.

4

Features they want CERTIFIED

They get fixtures Certified on all other important features they want and should have for a satisfactory lighting job: highly efficient lighting performance; durability and safety; ease of maintenance; high power factor (over 85%); flicker correction; the right ventilation for most light from their lamps.

This label means assurance of dependable trouble-free operation, performance that won't let them down now when time is short and every hour counts. It means assurance of lasting service, so important at a time when replacements are increasingly difficult to secure.

5

Choice to fit needs

Fleur-O-Liers are made by over 35 leading fixture manufacturers. Result: types, sizes and styles to fit any industrial or office need. And every unit carries the Fleur-O-Lier Manufacturer's guarantee!

This means choice enough to fit the requirements of any lighting job; greater availability, faster service on fixtures built to definite standards. You may sell Fleur-O-Liers made by several manufacturers—cash in on all of them.

Dominating National Advertising works for you!

Fleur-O-Lier advertising reaches your customers through SATURDAY EVENING POST, TIME, NEWSWEEK, and leading trade and business publications. Take full advantage of it!

You may get some of these important advantages in other fixtures
YOU CAN BE SURE OF THEM ALL IN FLEUR-O-LIERS

Send for free copy

of booklet "50 Standards for Satisfaction"—full of important information together with list of Certified Fleur-O-Lier Manufacturers. Use coupon below.



CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

who complies with FLEUR-O-LIER requirements

TEAR OUT AND MAIL

Fleur-O-Lier Manufacturers • 2122-4 Keith Building, Cleveland, Ohio

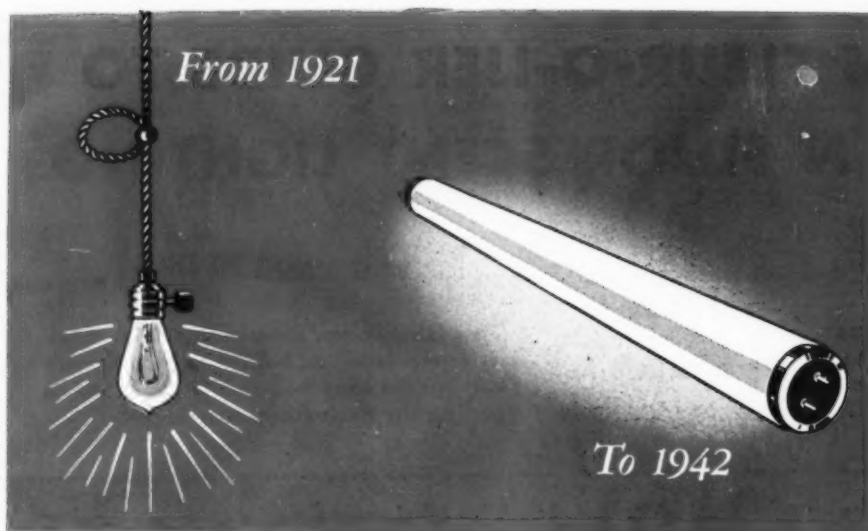
Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

Name _____

Address _____

City _____

State _____



INDUSTRIAL LIGHTING SPECIALISTS

Even in these war-busy days, a 21st birthday seems important enough to warrant a little celebration...and we have been at this lighting business now since the beginning of Warren Harding's administration, way back in the "good old" flapper-and-speakeasy days.

As specialists in the research, design and fabrication of equipment for the broad fields of industrial, commercial and flood lighting, we have developed many dependable ways to control incandescent, mercury vapor, fluorescent—and now the new RF—light sources to achieve maximum efficiency.

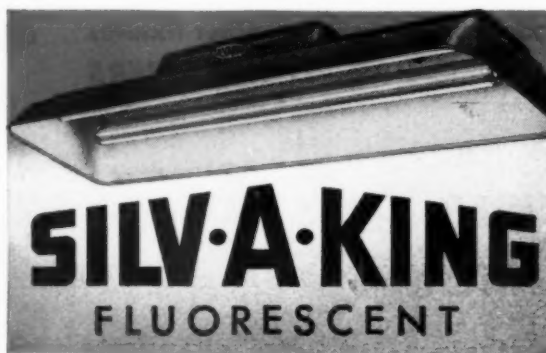
Why not put *your* lighting problems up to a specialist? Bright Light Reflector Co., Inc., 1033 Metropolitan Avenue, Brooklyn, N. Y.



Quality and dependability through two decades have linked the Silv-A-King name with such famous names-in-industry as:

AC SPARK PLUG
BETHLEHEM STEEL • BUICK
CHEVROLET • GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
RUPPERT BREWERY
WARD BAKING
and many others

Write for one or both of these Silv-A-King Lighting Guides: LG1—Fluorescent, or LG2—Incandescent.



SILV-A-KING MAKES *Light* WORK FOR YOU

Practical Fluorescent Servicing

[FROM PAGE 23]

- (b) *Improper line voltage.* Line voltage either above or below recommended range may cause starter to blink lamp on and off.
- (c) *Improperly designed ballast.* An improperly designed ballast may cause an improper lamp voltage and cause starter to blink lamp.

In a two-lamp ballast it is possible to criss-cross the starter leads or improperly connect the compensator so that the lamp may flash continuously or for a long period of time before lighting.

14. If ends of lamp remain permanently lighted with no effort to strike an arc, a short circuit in the starter is the most likely cause. This can be readily checked by removing the starter to see if the lamp will light or by replacing the starter by one which is known to be operating properly.

Other possible causes are incorrect wiring or ground in wiring or ballast. The most likely place for a ground to occur is at one end of the lamp sockets, particularly if it is mounted on metal.

15. If lamps blacken at ends early in life, the most probable cause is improper starting. Excessive starting current or improper operating current and loose contact in lamp sockets may also produce early darkening.

16. If average lamp life seems short, check burning record. The records of average lamp life should be as accurate as possible. If they definitely indicate short lamp life any one, or a combination of any two, or more, of the following conditions may be the cause:

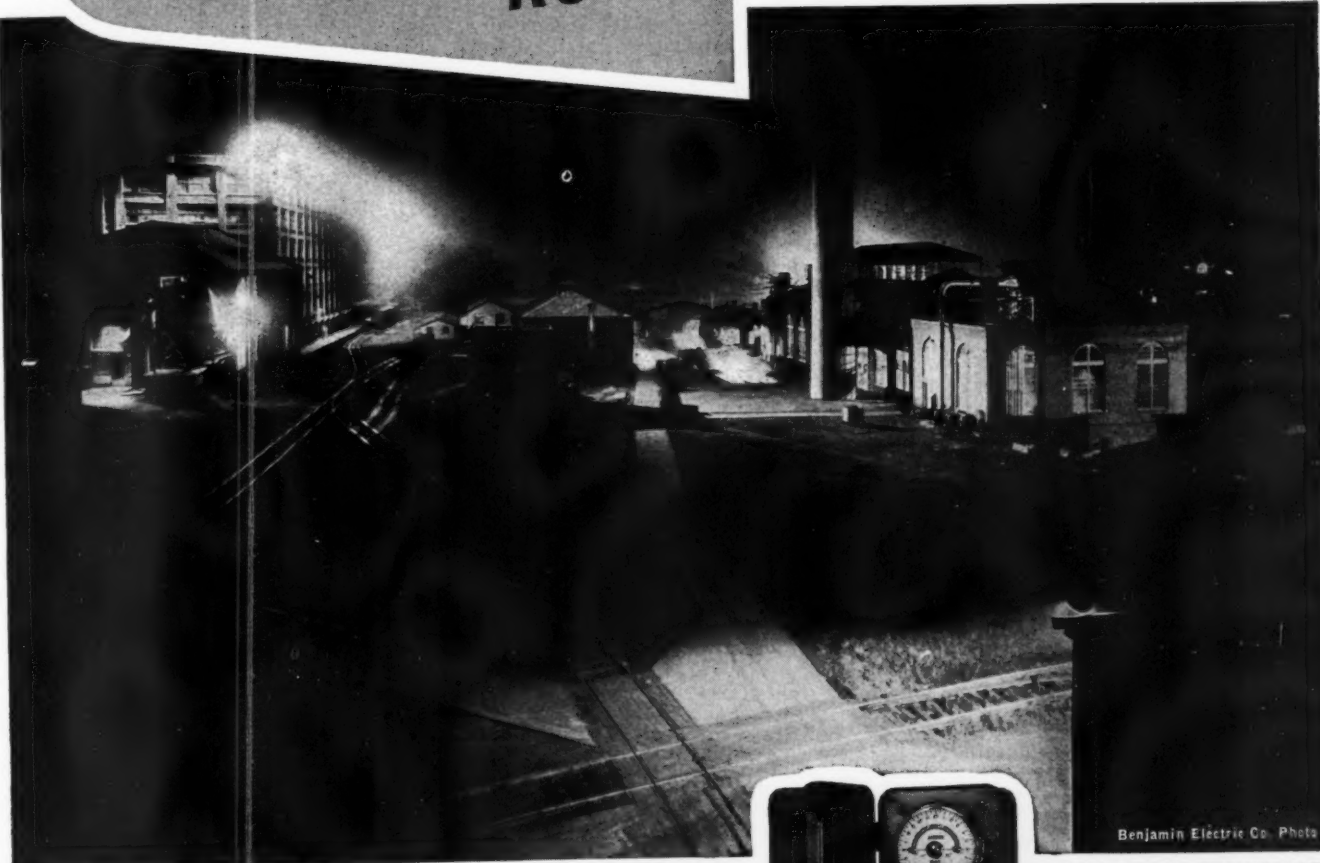
- (a) Performance not judged on average life basis.
- (b) Lamps started too frequently.
- (c) Improper starting.
- (d) Improper ballast equipment.
- (e) Improper line voltage.
- (f) Improper connections.
- (g) Loose contact in lamp sockets.
- (h) Improper surrounding temperatures.

17. If lamps flicker, swirl or snake, check the starter. Occasionally slight flickering or swirling appears in a new lamp but clears up or ages out as the lamp is burned. Turning lamp off for a few moments will frequently aid in stopping the flickering or swirling.

The most common cause of continued flickering or swirling is improper starting of the lamp.

ADD

DEPENDABILITY TO FLOODLIGHTING WITH AUTOMATIC CONTROL



Benjamin Electric Co. Photo

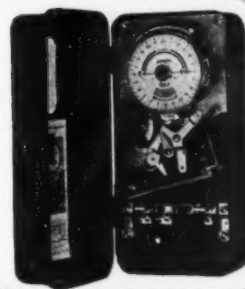
SANGAMO TIME-SWITCHES

War makes the protection of vital industrial properties with floodlighting more important than ever before—and the safeguarding of factory yards, building approaches, railroad sidings, transformer banks, and substations with floodlighting is considerably more dependable when this lighting is controlled automatically. Sangamo Time-Switches are designed for this purpose. Not only do they add dependability, but punctuality and convenience as well. If you are planning a protective floodlighting installation be sure to include a Sangamo Astronomic Dial Time-Switch in the control system.



Form KAZ astronomic dial time-switch will continue to change automatically its setting in accordance with sun-set and sun-rise.

Current interruptions up to 10 hours will not stop Form VSWZ astronomic dial time-switch, nor affect its "on" and "off" settings.



SANGAMO ELECTRIC COMPANY

SPRINGFIELD
ILLINOIS

ORANGEBURG HAS BEEN A LASTING NAME "UNDERGROUND" FOR 49 LONG YEARS



ORANGEBURG CONDUITS

Underground

Orangeburg Conduits are not only contributing to the continuity of power, lighting, and signal services in an ever increasing number of airports, but are providing for alterations or additions without disrupting field traffic.

ORANGEBURG *Standard* for installation *with* concrete encasement
MOCRETE for installation *without* concrete encasement

Photo: American Airlines, Inc.

**THERE ARE EXTRA PROFITS FOR YOU
 IN EVERY "time-and-material-saving" FOOT OF**

ORANGEBURG *Conduits*

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

Sales Agent—Distributors

GRAYBAR ELECTRIC CO., INC.

GENERAL ELECTRIC SUPPLY CORP.

4-FC-3

Industrial Electrification

CHANGEOVER

THE rapid swing to all-out war production from the normal products of commerce is a major operation in our industrial life. Much of the physical work of "conversion" is electrical. New wiring systems must be installed. Existing motor and control equipment must be adapted to new machines and schedules. Service entrance equipment and transformers must be enlarged, replaced or paralleled with new for increased electrical loads.

Just as conversion to war work is the urgent responsibility of every industrial plant with usable facilities today, rewiring to meet the added electrical burden is the urgent responsibility of electrical departments and industrial contractors. And in the conversion it is well to look ahead to further changes as war demands call for new designs and processes.

In the coming months the job of utilizing every available industrial plant for direct war production will be speeded through extensive subcontracting. The time to appraise electrical system's capacity and flexibility is now.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste
15. How to Save Power
16. Protection Against Sabotage
17. Improving Working Conditions
18. Electrifying for Continuous Operation
19. Electrified Plant Housekeeping
20. Electrical Problems Under 168 Hour Schedules
21. Electrical Aids to Plant Conversion (this issue)

Future articles will discuss—

22. Electrical Aids to Quality Control
23. Factory Codes
24. Welding in Industry

ENGINEERING • INSTALLATION • MAINTENANCE

ELECTRICAL AIDS TO PLANT CONVERSION

CONVERTING a plant to war production may involve electrical changes from complete rewiring and new electrical equipment to minor circuit changes and re-location. In most conversion jobs existing facilities are used to the extent that they fit the new work to be done. But every conversion job requires skillful planning in adapting new and existing electrical equipment to new production lines.

A great many things not normally produced in peace, such as tanks, guns, and airplanes must be made. But these are built principally from component parts which are regular products with minor changes. Also required will be shoes, gloves, hats, cooking equipment, mattresses, wheel-barrows, shovels, surgical instruments and medical supplies, as well as such items as wallets, garden-hose, buckets, sponges, or flag-staff bands. The major change is in the number of each item which must be turned out. If your product is related to a needed article, some government agency probably will want all you can manufacture.

The amount of war production to be made in existing plants must not be obscured by headlines given the Chrysler Tank plant or the Ford Bomber plant. Some of the major suppliers of war materials have built new plants. Tanks are being made in plants formerly devoted to building railroad equipment. Machine guns are being turned out where axles were formerly made. Small arms parts are produced where sewing machines and typewriters were made. Army and Navy radios come from commercial radio plants. Surgical instru-

ment makers are supplying armed-force needs.

None of these cases is spectacular. Tanks do not differ greatly from heavy railroad equipment; machine guns resemble axles, the fine machine work on small arms parts is quite similar to that on sewing machines and typewriters; radio is still radio; and the surgical instrument makers simply stepped up production.

In each instance, someone established the article which could be produced with the least amount of change in existing plants. Orders were placed. The machines started on their new assignments.

A few of the factors involved in this task must be mentioned.

Custom production has small place in the war program. Mass output is compulsory on almost every item, for each

MACHINES are moved with electrical equipment intact. Converted feeders must have sufficient capacity to readily handle new machine arrangements.



individual need is multiplied many times. The machine which was satisfactory for custom work must be altered, refurbished, or relocated for production work. There will be little chance of securing special machine-tools, for new plants being built for special purposes will get first claim. There is even the possibility that high-precision tools now owned may be taken from you if some other plant can make better use of them.

Exacting Specifications

Specifications on government purchases are much more rigid than has been common in commercial practice. The tolerances are much closer, and machines must be maintained in better condition if these limits are to be met. Inspections are much more severe. Minor flaws which have been unobjectionable in commercial use might cost a fighting man's life.

In spite of any present discussion about labor, keep in mind that there will not be enough men to turn out all the materials scheduled to be made. Considered with each revision of machine or method should be the possibility of reducing man-power, or of making the work light enough to be done by women. Also, skilled men will be needed in key positions in the many new plants being erected, therefore attention should be given to devising ways of making operations automatic or simple enough to require an attendant.

Greater emphasis must be given to reduction of lost time from accident and sickness. In spite of the very successful safety campaigns of the past, the number of productive man-hours lost through accident and sickness are at a rate sufficiently high to cut possible output appreciably. New facilities should be incorporated which will help reduce accidents and the spread of sickness.

Reduction of lost machine hours

Because war material is so completely the output of machines, every effort must be made to keep machines in productive operation the greatest number of hours daily. A machine waiting for material, for make-ready, or for change of dies or molds, is a machine out of production even if the attendant's time is fully occupied. The reason for this waiting time should be established, and the number of idle hours reduced. Since, in case of attack at home, production will be more vital than ever, those things necessary to keep the wheels turning during blackouts or other protective activities must be provided.

The electrical department will be involved in each of these activities. By

taking advantage of the many electrical aids which are available, conversion to mass production on war work can be made easier.

A system review will establish present electrical capacities, and the flexibility of present equipment. After manufacturing revisions have been planned, the electrical system will be restudied to discover what changes must be made to suit the new conditions best.

Electrical facilities naturally start with the Power Company connection or the generators. Total of present and available electrical capacity can be learned easily. Care should be exercised to insure that the maximum amount of this capacity is available for active loads. Power-factor should be maintained at a



ARMORED VARNISHED CAMBRIC feeders cut rewiring time in a shell plant. Multi-conductor cables with interlocked flexible steel armor are adaptable to many conversion wiring jobs.

level higher than has previously been considered economical. The urgency of making full use of equipment rather than the bonus on the power contract or the number of kilowatt hours saved will be the determining factor.

Distribution of electrical energy through the plant may be of a type which uses excess materials, causes excess losses, and makes for poor operating conditions. If load increases are contemplated, an extensive rearrangement of the distribution system may make a new installation much cheaper to put in and more efficient to operate.

Placing transformers near major load centers allows the use of small wire from the power source to the load center. At higher voltage, the losses are less, and maintaining correct voltage for efficient operation of motors and other electrical equipment is much simpler. Larger motors should operate at this higher voltage to avoid the necessity for additional transformers and copper, and to extend transformer capacity to cover a greater amount of load not adaptable to high-voltage use. Large air-compressors, pumps, motor-generators, mill motors and similar units are adaptable to high-voltage supply. Synchronous motors will help improve the over-all

power-factor without adding much to the total cost of the equipment.

Load centers should be located so that sub-feeders are short, limiting the amount of large copper needed, and reducing line loss. If sub-feeders are of enclosed busbar construction, load may be tapped off at frequent intervals without affecting the efficiency of the installation. Should the load be scattered over a wider area, the bus feeders may be tied together to form a ring which will help to maintain proper voltage at all points on the ring.

This type of distribution, having convenient power outlets every few feet, permits easy shifting of machines should rescheduling show that a different arrangement is more productive. It will also permit the addition of new machines in a production line without running new sub-feeder circuits. On mass production, flexibility of installation and operation carries a high premium, for machine hours are gained from time otherwise taken up by maintenance and plant rearrangement.

One lesson learned from the automobile production line has been the volume of operations which can be performed quickly with specialized hand tools. By having the proper tool conveniently located, minutes are saved on each of innumerable jobs. This practice can be profitably adopted by war material makers. But its success is dependent upon a multiplicity of convenience outlets so that the hand tool may be used at the proper time and place. If a bus with movable contacts is used, the tool may move with the work or as needed.

These same convenience outlets may supply energy for additional lighting designed for specific duties. If the contacts are movable, the lights may be brought together for high intensity inspection, or separated for increased illumination at many points.

Old wiring

Old wiring should be utilized wherever its use will not detract from the operating efficiency of the plant. Make sure that it is carrying not more than its designed load, that connections are in good condition, and that proper switches and fuses are used. Old feeders may be joined into a ring to supply several load centers, effectively increasing capacity and maintaining better voltage conditions. If wiring must be reinforced in an area now fed by old circuits, the older lines may be used as independent feed lines for essential services. Or the usefulness of long loaded circuits may be extended by installing transformers at either end, thus increasing its power carrying capacity by making it a higher voltage transmission line.

ELECTRICAL AIDS TO PLANT CONVERSION

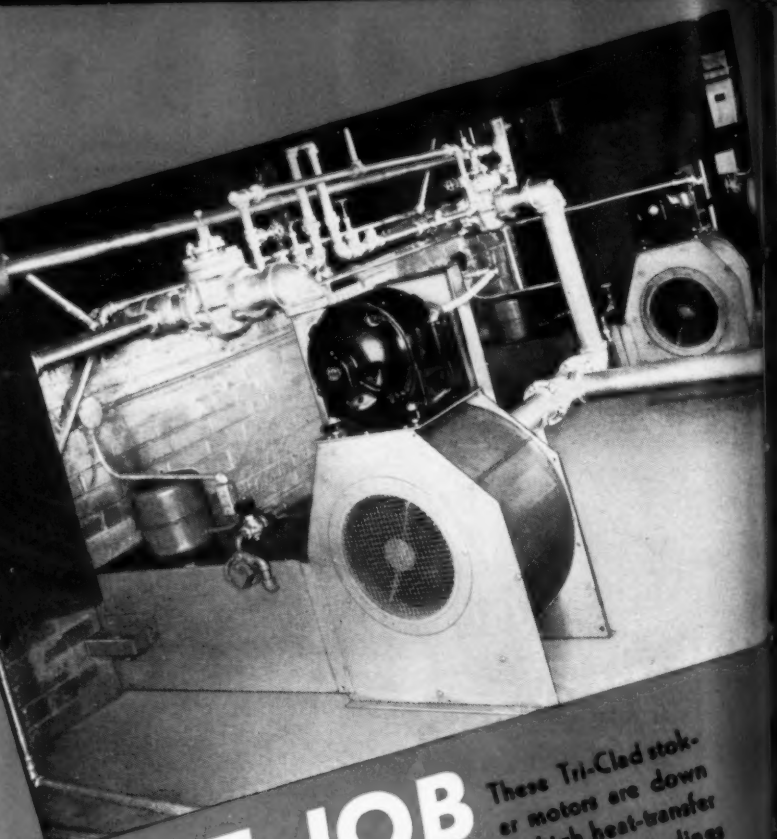
Check Sheet

WHOLE PLANT	YES	NO	EACH MACHINE	YES	NO
Has equipment been listed?	Is machine properly located?	.....	.....
Has product of each machine been studied for its possible war application?	Does it discharge into next operation?	.....	.....
Is total electrical supply known?	Is product inspected at each operation?	.....	.....
Is total electrical load known?	Has inspector all necessary facilities?	.....	.....
What is power-factor at peak?	Can machine speed be increased?	.....	.....
Can power-factor be improved?	Can machine do more than one operation?	.....	.....
Is distribution system heavy enough?	Can work be done on another machine or in another way?	.....	.....
Is voltage maintained at machines?	Is the motor the correct type?	.....	.....
Has value of high tension transmission to load centers been checked?	Can automatic feed be attached?	.....	.....
Must any feeders be replaced?	Will electric selectors aid?	.....	.....
Will a ring bus improve voltage?	Will limit switches speed work?	.....	.....
Will busbar distribution help?	Are counters needed?	.....	.....
Are present feeders properly located?	Can an automatic timer be used to advantage?	.....	.....
Are there separate circuits to essential services?	Can an electric hoist be used?	.....	.....
Is general illumination adequate?	How many productive machine hours are lost?	.....	.....
Have separate circuits been prepared for emergency lighting?	Can one attendant operate more than one machine?	.....	.....
Are conveyors in general use?	Is number of hand tools adequate?	.....	.....
Are aisles right for electric trucks?	Are outlets conveniently located for hand tools?	.....	.....
Does production flow in a straight line?	Is material delivered at correct height?	.....	.....
Can machines be shifted easily—electrically?	Is there enough light?	.....	.....
Are there outlets for hand tools?	Should lighting units be movable?	.....	.....
Is the temperature uniform?	Are there bright surfaces to reflect glare?	.....	.....
Does humidity affect product?	Is background a contrasting color?	.....	.....
Must dust be removed from air?	Can induction or radiant heat be used?	.....	.....
			Can conveying and processing be combined?	.....	.....



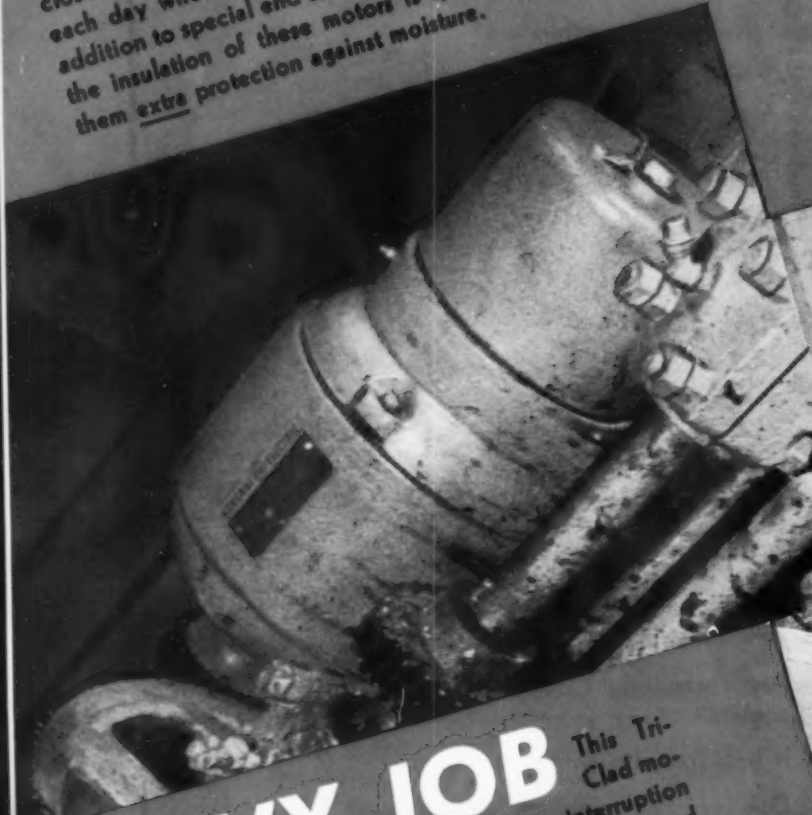
WET JOB

Here's a Tri-Clad splashproof motor close to the floor in a dairy plant. It gets its share of the wet each day when pipes and floor are cleaned and steamed. In addition to special end shields and watertight conduit boxes, the insulation of these motors is specially designed to give them extra protection against moisture.



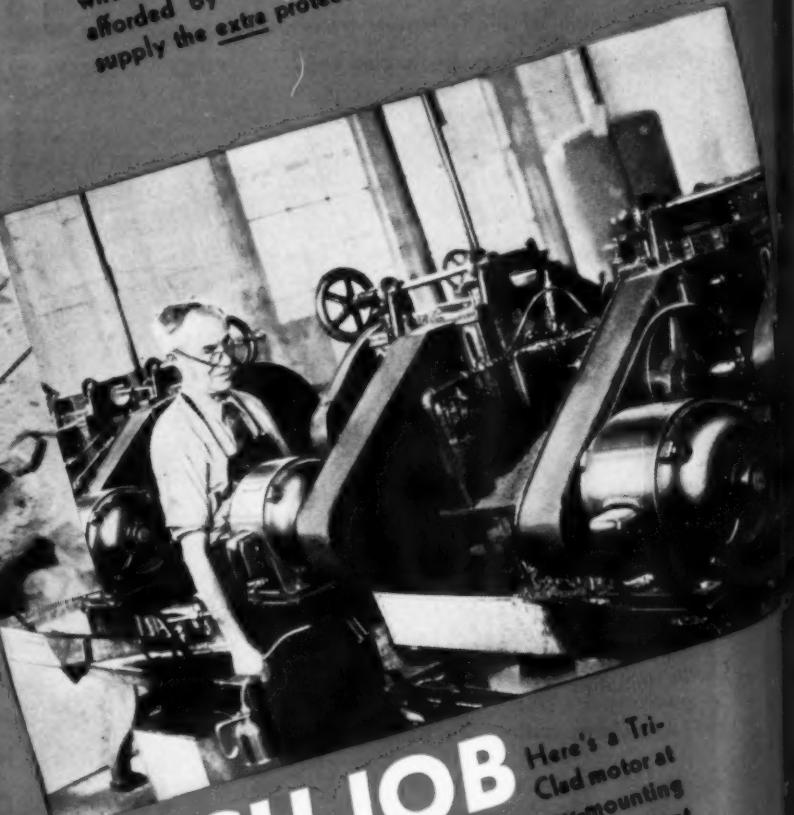
HOT JOB

These Tri-Clad stoker motors are down where red-faced firemen used to sweat. The high heat-transfer afforded by double-end ventilation and Formex windings supply the extra protection needed for this service.



HEAVY JOB

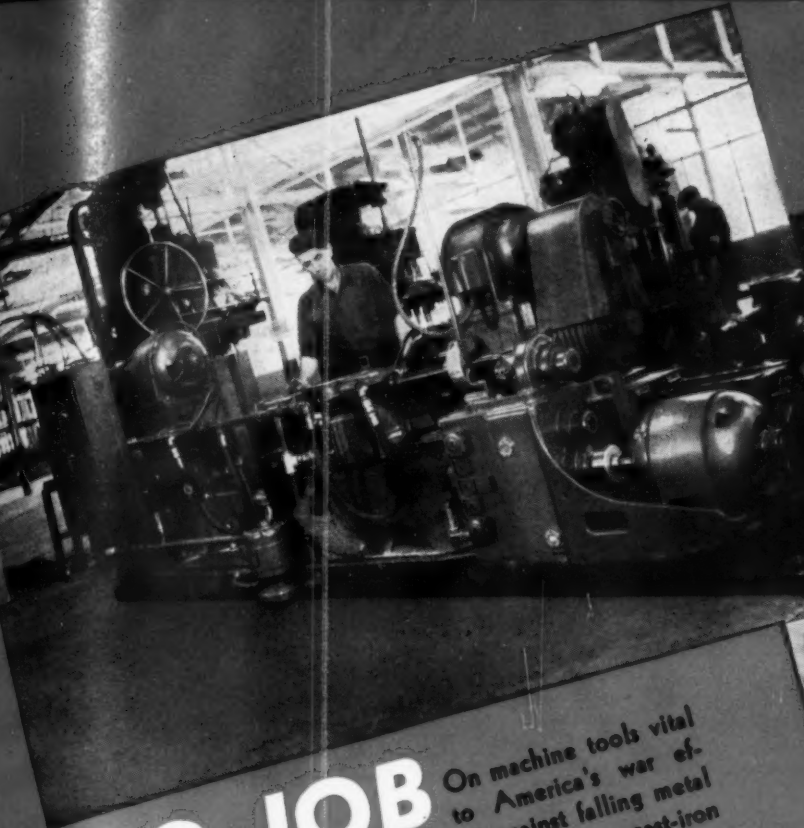
This Tri-Clad motor is installed on a lift bridge, where a service interruption could be serious. In these surroundings, where grease and grime are to be expected, a protective frame is an important factor in continuous operation.



RUSH JOB

Here's a Tri-Clad motor at work in the arms industry. The many easy-mounting features of Tri-Clad motors can help plants get important tools into operation quickly. Their extra-protection features will help keep vital equipment in triple-shift operation.

BUILT FOR PROTECTION FIRST TO LAST!



BIG JOB On machine tools vital to America's war effort, Tri-Clad motors are well guarded against falling metal chips or dripping coolants by their own sturdy, cast-iron frame and end shields.



DIRTY JOB Note how dust and fumes have coated this Tri-Clad ball-bearing motor. While this is service for which we do not recommend open motors, such as that shown, we are glad to chalk up this instance of motor stamina under severe operating conditions.

TODAY'S TOUGH JOBS

CALL FOR **TRI-CLAD** MOTORS

NOW more than ever, you must be sure that your motors give you 24-hour operation, even on the *toughest* jobs. Here's where Tri-Clad motors can be a real asset—their *extra protection* features* give them the stamina necessary to keep your equipment in operation in spite of adverse operating conditions.

The Tri-Clad motor's cast-iron frame and end shields are a safeguard against accidental blows—they shield the motor from falling objects and dripping liquids. The stator winding, of Formex wire, is

proof against damage from oil, moisture, and heat shock. Improved bearings are easily lubricated, and are sealed against the entry of dust or dirt by complete enclosure in cast iron.

All in all, these protection features are sound assurance of an *extra tough* motor for use on equipment that can't be allowed to quit on the job. Ask your G-E representative for details on types and sizes now available, or write General Electric, Schenectady, N. Y.

*Extra protection against physical damage, electrical breakdown, and operating wear and tear.



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.



GENERAL  ELECTRIC

750-112-8058

A separate circuit for emergency lighting during blackouts is almost compulsory in many localities. If this is connected ahead of the main lighting switch, pulling the main switch will extinguish all lights except the emergency units. Unused circuits may be available for this purpose.

Saving priceless minutes

All present manufacturing methods and procedures must be reviewed, electrically. This should cover every operation and every handling, the condition in which the raw material is received, machine speeds, methods of machine feed and ejection, conveying, and the possibility of processing in transit. Thinking in terms of thousands instead of dozens, in terms of hours rather than weeks, should disclose many short-cuts that can be provided by electrical means. Indeed these short-cuts must be found. Minutes cut off elapsed production time may be priceless.

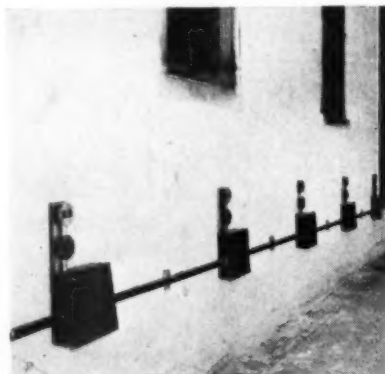
Many machines can be adapted to automatic or semi-automatic operation by the use of electrical control units. Automatic feed can be introduced by electrical releases in some cases. Automatic cycle control can speed operations and remove likelihood of human error. Automatic stops, cut-offs, or starters can be added. Limit switches, timers, thermocouples, counters, selectors, and innumerable other electrical control units can be secured and adapted to specific tasks. By their application the multiple objective of more output, more accurate production, less waste and less labor, can be accomplished.

Regrouping of machines offers many opportunities for saving of time and labor. It may be possible to make one machine feed directly into another, or the discharge hopper of one unit may be made the feed hopper of the next. If this is not practical, a short chute or conveyor can carry the part automatically into the feeding unit of the next machine. In any event, placing machines in their proper order of production, with minimum spacings, will reduce handling time and labor. If bus distribution is now in place, this regrouping can be done almost without electrical changes. If rewiring is necessary, a flexible outlet system such as bus distribution should be installed. Having sampled the advantages of machine regrouping, this practice probably will be followed in each modification of the production schedule.

Keeping in mind that total output is dependent upon machine production hours and also that labor shortages may become critical, increased attention should be given to operating machines in batteries. In this way, the operator

can be performing necessary duties on one machine while others are producing. In many instances, such as moulding presses, duplicate moulds may be utilized. While one cycle is being completed in the press, the duplicate moulds can be filled for insertion as the first mould is removed. Electrical alarms or control units can prevent overtreatment or signal the operator that a machine has completed its cycle and is ready for the next.

Some operations can be carried on at higher speeds. Simply changing the motor to one of higher speed may be enough. In other cases two or more operations may be performed on the same machine, but one or more can be executed at much higher speeds. Variable or multi-speed motors may make it possible to reduce total time, and avoid time lost in setting-up if the piece



FLEXIBLE POWER circuit for small motors is ready for any new machine sequence or arrangement.

is transferred to a higher speed machine. With proper controls, these speed changes can be made automatically without attention by the operator.

All of these are for the purpose of shortening the production cycle by eliminating lost machine time. Check whether setting-up time is out of proportion, whether a machine is idle while material is being prepared, or whether it takes too long to get the finished piece away from the machine. Too many cases exist where the operator is continually busy, but the machine is producing only a fraction of the time. If there is any question about the hours of machine time lost, a graphic electrical meter will provide a record.

Use of motors with proper characteristics may speed production and reduce maintenance. Variable speed, high torque, slip-ring, gear-head, synchronous, or other type motors have characteristics which make them most suitable for certain loads. Fitting the motor to its task insures operation with the least amount of maintenance.

Substitution of machines may reduce time and cost. Since new tools and

equipment will be difficult to obtain, ingenuity must make the old machines more versatile. Machines may be converted to perform tasks for which they were not originally intended. Special jigs may be set up to make possible unusual operations. Grinding may replace milling and accelerate production. In some cases, infra-red or induction electric heating may replace other fuels at a great saving in time.

Elimination of heavy lifting will increase the productive abilities of men, and will be compulsory for women. Consequently, attention should be given to the height of working tables, the elevation and delivery point of conveyors, and the method of transferring material to the working plane. Electricity will lift the loads tirelessly. If heavy articles must be pushed into position, rollers in the table top will make pushing easier.

Processing while conveying is often possible. This is one of the outstanding advantages of infra-red heating where baking, drying, or preheating is a part of the process.

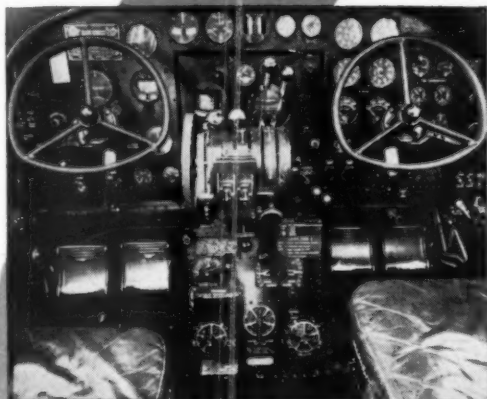
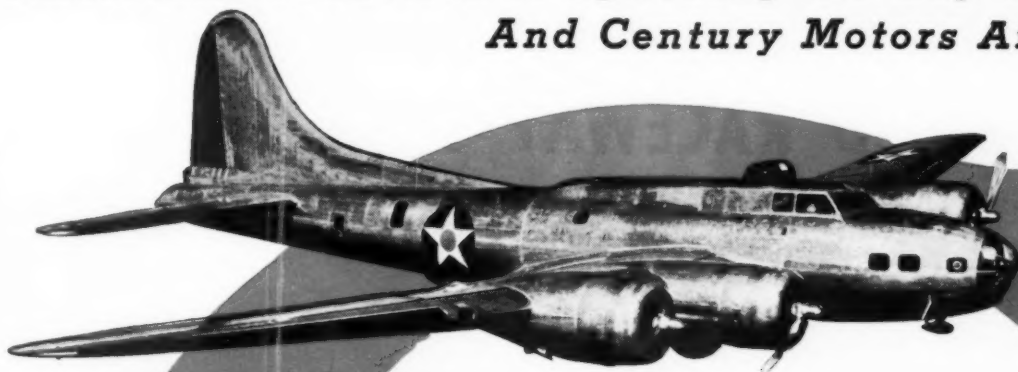
In the sequence of production, inspection should follow each operation. Electrically operated guides, gauges, color selectors, and so on, may be installed in the line to the feed hopper for the next operation, making inspection almost automatic and instantaneous. In most cases, electrical instruments will help the inspector make quick accurate tests.

Tolerances permitted on most war items are much less than are encountered in commercial practice. For some items, temperature or humidity changes alone cause variations greater than allowable limits. Air conditioning units, electrically driven and controlled, can provide air with temperature and humidity maintained as needed. Likewise for those units which might be spoiled in a dusty atmosphere, there are electrically operated or electro-static units which will cleanse the air.

Better working conditions

High intensity illumination aids production and makes close inspection easier. Where color and bright surfaces are involved, the character and intensity of the lighting must fit the task. Monochromatic lighting deadens reflected glare. Colored lighting makes certain colored objects more vivid. Since a contrast of color is one of the best aids to easy seeing, backgrounds should be painted in a color which will make the object "stand-out". Production increases and accidents are fewer when machines have stationary parts painted one color, moving parts another, each in contrast with the work, for seeing is made easy.

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And Century Motors Aid Production*



Official Photographs, U. S. Army Air Corps

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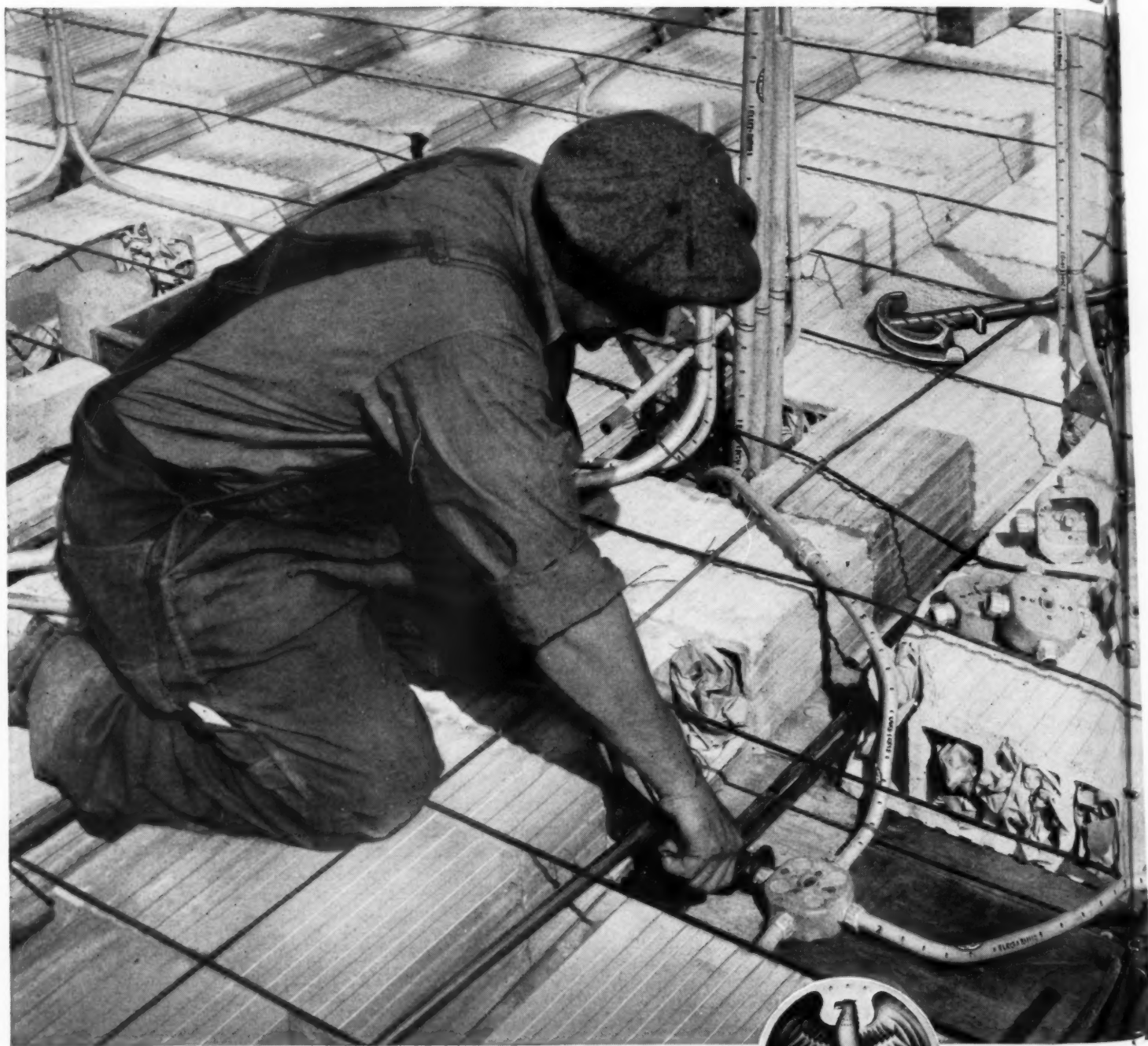
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It is streamlined in weight—is easy to handle even in difficult locations. It is streamlined in fittings. There are no threads to cut—two simple compression-type fittings make watertight joints. Wire pulling becomes streamlined, too—requires less effort, because of the thousands of tiny knobs on the inside surface.

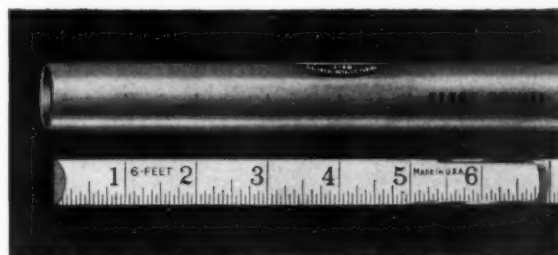
The latest streamlined feature is the continuous foot-rule clearly printed on every length of tubing. Seldom is a foot-rule needed—and the mark for cutting or bending already is made.

With the new streamlined ELECTRUNITE bender—with streamlined instructions and diagrams on a tag with every shipment of tubing—any good mechanic can make bends more easily and accurately than ever before possible.

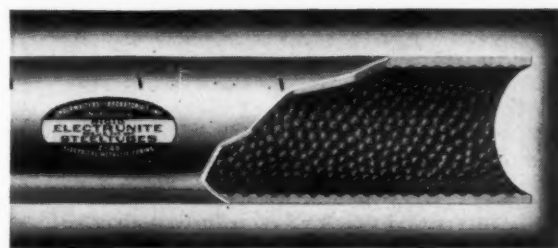
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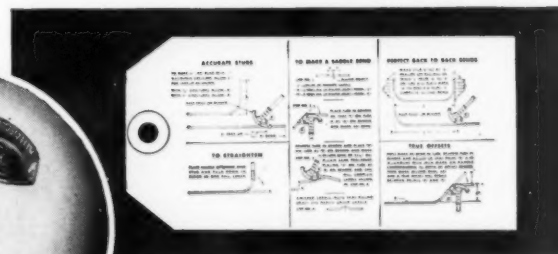
From end to end, every length is clearly AND ACCURATELY marked off in feet and inches.



The patented knurled inside surface makes wire pulling as much as 30% easier.



Simple fittings end dirty thread cutting and laborious "steam-fitting" work.



You can't go wrong with these simple bending diagrams furnished with each shipment.

The ELECTRUNITE bender predetermines bends for you—saves a lot of work.

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CONTINUOUS FOOT-RULE ON EVERY LENGTH!

Electrical Contracting, April 1942



IF BRUSHES WERE BULLETS

there would be no question of their vital part in winning the war . . . a rain of metal hail against heil-hungry Hitler, hiss-sneaking Hirohito, and mire-besmirching Mussolini. Yet, after a fashion, motor brushes are munitions of defense on the home front . . . a vital part in the generation of electricity and the operation of motors which mean the forward march to victory!



WE DO NOT CLAIM THAT THE DIFFERENCE BETWEEN SUPERIOR BRUSHES AND OTHER MAKES SPELLS THE DIFFERENCE BETWEEN SUCCESS AND FAILURE . . . FOR ALL BRUSH MANUFACTURERS TODAY ARE DOING A GREAT JOB . . . BUT WE DO SAY THAT USERS OF BRUSHES SHOULD "look at your brushes and make sure you are adopting the exact type of the best quality possible"—replacing in ample time to avert interrupted motor operations.

We offer the engineering counsel of our long experienced organization to those with a problem to solve—whether or not Superior Brushes are purchased. We justifiably think we have a product that is "all that the name implies."

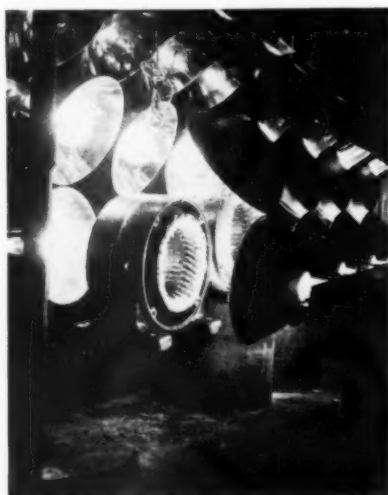
**SUPERIOR
CARBON PRODUCTS
INC. . . 9115 George Ave.
CLEVELAND
OHIO**

All that the name implies

Baking Increases Motor Resistance

The rewinding of motors depends to a great extent on the varnish and baking they receive. The old gas or electric oven proved unsatisfactory because the inside slots were not baked dry as quickly as possible.

In the new infra-red tunnel at The B. A. Wesche Electric Co., Cincinnati, it is now possible to receive $\frac{1}{2}$ to $7\frac{1}{2}$ hp. a.c. stators for rewinding and return them the same day. When a stator or armature is first placed in the tunnel after rewinding, a vapor rises from the winding. After this thinner has been vaporized the body of the varnish remains and the part being baked remains for a period of one to two hours. This



REFLECTORS on flexible hinges allows prefocusing of heat direct to stator being baked.

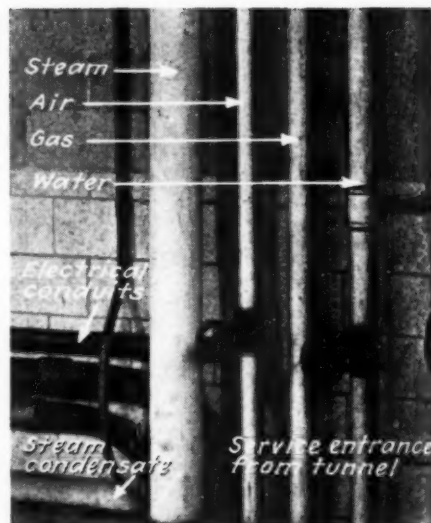
is in contrast with the previous time of six to eight hours for a good baking job. The process, according to Wesche, adds 100 percent more resistance to motors to oil and moisture than when baked by the old methods.

Service Facilities Kept Out Of Way

The accompanying photo is a good illustration of keeping service facilities in one corner and out of harms way. All of the services enter the building from a common tunnel and thereafter are kept close to the walls to improve working conditions at the new Arthur D. Little chemical research building in Cambridge, Mass.

In many instances a set-up as this often aids the maintenance department in locating faults and outages. It is no longer necessary to keep detailed drawings of the facilities which may be scattered all over the plant.

Good housekeeping is also a feature



SERVICES ENTER from a common tunnel at the new plant of Arthur D. Little, Cambridge, Mass.

that is enjoyed. There are no ugly pipes protruding here, there and everywhere. The necessary "ugly duckling" is in its place, relegated to a spot that does not mar plant beauty, but easily accessible.

Relieving Pipe Stresses Electrically

The Power Piping Division of Blaw-Knox Company controls the cooling of welded joints with an electric stress reliever (Detroit Electric). The cooling is performed to increase the ductility and shock resistance of the joints. The reliever, primarily a coil, heats the weld and adjacent areas to 1,100–1,200 deg. F. and allows them to soak at this heat. The temperature is accurately held at these heats through a potentiometer and thermocouple control apparatus. It is reported that the ductility is increased 50 per cent and impact strength raised 15 per cent.

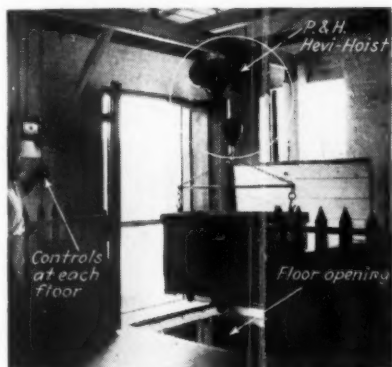


INDUCTION HEATING aids cooling of welded joints.

Electrical Contracting, April 1942

"Elevator" for Cramped Space

Today space is at a premium. Idle floor space in busy factories is a thing of the past. Many plants are faced with the problem of transporting bulky material from one floor to the other. One company solved this problem by cutting holes in the floors and install-



THE MAN at the controls positions the lifting job. The hoist operates only when he has finger on the button.

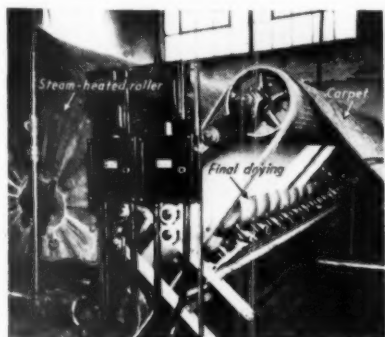
ing an electric hoist to do the lifting. A set of stop and start push buttons was installed at each floor to control the movement of the lift. The dollies can be taken off at any floor.

Infra-Red "Booster" Added to Carpet Drying

Production was lagging at Downs Carpet Company, Phila. Something had to be done about it in order to meet the increased demands. Investigation proved that the steamheated roller could not be speeded up.

Instead of installing an extra steam roller to dry the not quite dry rugs Downs rigged up an ingenious arrangement of infra-red lamps. Now as the carpets come from the roller, still slightly wet, they come face-to-face with a bank of 28 250-watt infra-red lamps.

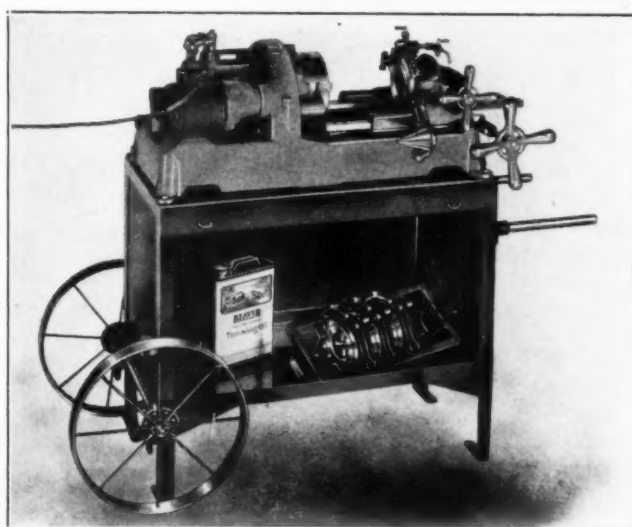
In the final analysis is proven that the additional 7 kw. of load has speeded up the drying operation 35 per per cent and reduced overall drying costs.



ONLY 7KW. of infra-red heating speeds up this drying operation 35 per cent



● An idle motor is a drag on the war effort of the nation. We make it easy for you to do your part to keep 'em humming. Bunting Bronze Electric Motor Bearings completely machined and finished—ready for assembly—are available from local wholesalers and Bunting warehouses. Also Bunting Precision Bearing Bronze Bars in many sizes, finished I.D., O.D. and ends. The Bunting Brass & Bronze Company, Toledo, Ohio... Warehouses in All Principal Cities.



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1/8 to 2-inch Pipe and Bolt Machine

For 3/8 to 2-inch pipe—1/4 to 1 1/2-inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.

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Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

TESTING FLUORESCENT LIGHTING EQUIPMENT

QUESTION 42. Will you please tell me how to test ballasts, compensators and starter switches on fluorescent lighting equipment?—J.H.F.

A. TO QUESTION 42. Testing auxiliaries, except for continuity, requires an array of accurate instruments and interpretations of data. A simple continuity check would be to insert a voltmeter in series in the circuit. If a glow switch is used substitute it with a voltmeter. The following suggestions apply to auxiliaries.

1. Low p.f. single-lamp ballast. Measure resistance with ohmmeter, and compare with effective resistance obtained with wattmeter and ammeter. Effective resistance should be higher (subtract meter losses). Pass rated current through ballast and measure watts, volts and amperes. Compute p.f. and watts loss. Loss should be around 20 per cent to 30 per cent and power factor around 50 per cent. Test for inductive kick on d.c.

2. High p.f., single-lamp ballast. Same as low p.f. except for additional computations of coil resistance and reactance; condenser capacity and reactance. Pass rated current through combination and read watts, amperes and volts. Compare with computed results obtained on single unit readings.

3. Two-lamp ballasts require readings taken for low, and high p.f. In addition, check step-up transformer and power factors of each of two output terminals.

4. For compensators apply same test

as for single-lamp low p.f. ballast. The losses should be about one-half that of the ballast.

5. For a glow switch, test its resistance with an ohmmeter. This will determine if the condenser is shorted or the contacts closed. Connect a glow lamp in parallel in the circuit and determine if the contacts function.

6. For a thermal switch check for continuity. Pass rated current through it and determine if contacts open by means of a glow-lamp.

7. For a magnetic switch same as for a thermal unit. Do not apply any unit directly on the line, use a current limiting adjustable impedance.

There is on the market a fluorescent tester which is described in the new products section Page 126 of the November 1941 issue of *Electrical Contracting*.—O.A.

A. TO QUESTION 42. With an improper starting unit, lamp will not glow. With a faulted starting unit lamp will be slow in showing brilliance. Substitute a new starting unit. With a defected ballast or compensator lamps will not glow (starting unit is the weaker unit of the assembly). Shunt in another ballast or compensator (with late type ballast, compensator is made within ballast case).—L.V.M.

INCREASING MOTOR SPEED

QUESTION 43. How is the necessary resistance for a field rheostat computed for a direct current adjustable speed motor and for a constant speed motor, to increase the speed 25 per cent?—H.R.S.

A. TO QUESTION 43. In order to compute the necessary resistance for a field rheostat for a direct current motor to increase the motor speed, it is necessary to start with the speed equation for a direct current motor. The speed equation is:

$$R.P.M. = \frac{K \times (E - I_a R_a)}{\phi}$$

K = A constant; E = Applied voltage; I_a = Armature current; R_a = Armature resistance; ϕ = Total flux per pole.

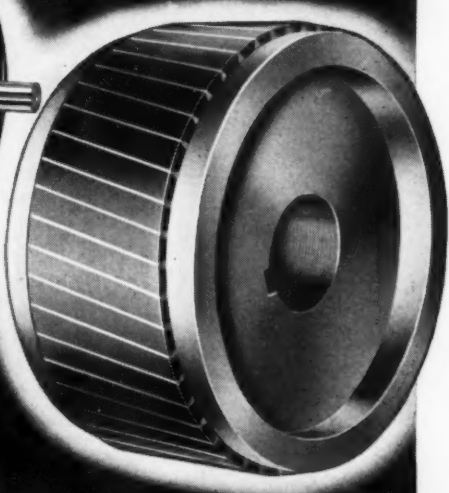
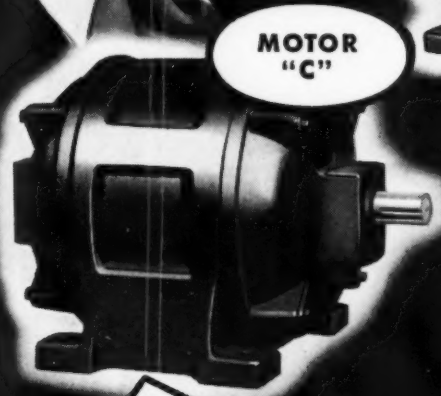
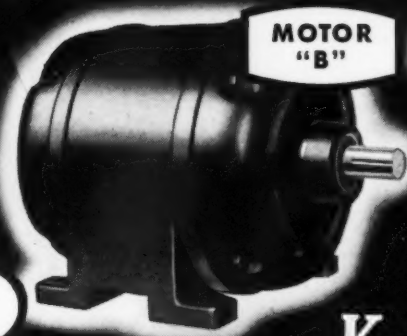
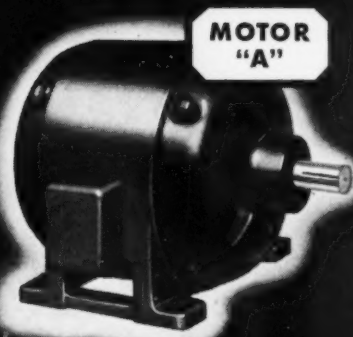
To increase speed, ϕ must be reduced.

For a speed increase of 25 per cent the necessary resistance of the field rheostats will be about equal to two-thirds of that of the field.—V.M.

A. TO QUESTION 43. In order to compute exactly the resistance for a shunt field rheostat to increase the speed of a direct current adjustable speed motor or of a constant speed motor 25 per cent, it would be necessary to know the normal field current, the resistance of the field circuit and the relation between the field current and back voltage or induced voltage. A 25 per cent increase in speed will require an approximately 20 per cent decrease in field strength. This will mean more than a 20 per cent decrease in field current because the steel of the field poles will be nearly saturated. In general a variable field rheostat should have a total or maximum resistance equal to that of the field coil circuit. It must be able to carry the field current without overheating. The resistance can be set after trial to give the desired speed.—J.E.W.

A. TO QUESTION 43. Inserting a resistance in the field circuit of an adjustable, or a constant speed motor will reduce directly the ampere-turns of the field. The ampere turns in effect will vary the flux. However, the flux density is dependent also on the characteristics of the iron, consequently the net difference can be determined only through the use of the B-H curve. One method of computing the amount of resistance needed is to run a magnetization curve test on both motors. This will reveal the point where each motor field is working. The rpm, cemf, armature drop, friction windage, etc., can then be determined, and equations set up for computing approximately any practical speed.

It is often difficult to run a magnetization test in the field and a more practical method must be resorted to. The next method is to insert a field rheostat which will have sufficient capacity to withstand continuous operation. The field current and resistance should be determined. This will require only one



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PAINE SINGLE MACHINE BOLT SHIELDS



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Fig. 970

There's nothing better for heavy duty fastenings to Concrete, Brick, Marble or Stone where a machine bolt must be used. The powerful interlocking construction provides for uniform expansion and strong bearing full depth of hole. Made for all standard machine bolts.

PAINE MALLEABLE LAG SCREW SHIELDS



Fig. 980

This easy-to-install malleable expansion shield solves the problem of fastening equipment to Brick, Concrete, Marble or Stone with lag screws. Each shield has a deep positive thread designed to fit any square or flattened head lag screw. A permanent fastening in which the screw cannot strip or freeze.

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Reader's QUIZ

[FROM PAGE 68]

test with an ammeter. I have laboratory test data which shows that reductions of 60 per cent to 40 per cent in field current, constant load torque, on shunt motors, increased the speed 25 per cent.—O.A.

CAPACITOR BLOWS FUSE

QUESTION 44. Four banks of 3-phase, 440-volt capacitors of 100 kva. each were put in two different places to improve power factor in our plant—three banks in one spot and one bank in the other. Each bank is controlled by a fused 200 amp. safety switch and each of the 10 capacitors in the bank has two 30 amp. fuses. Lately we have had trouble keeping these fuses from blowing out. No short or leak or ground is evident. The cables connecting capacitors and switches are warm but not hot. What is the cause and what is the best way to service them?—J.J.M.

A. TO QUESTION 44. Normal current at 440 volts and rated frequency for each 10 kva., 3-phase unit in the 4 banks of capacitors is 13.1 amp. per lead. The maximum permissible working voltage is 510 volts, and at this voltage the current will be increased to 15.3 amp. Capacitors are usually designed to carry 35 per cent kva. overload continuously.

With the air temperature at 24° C. a 30 amp. fuse should carry $1.10 \times 30 = 33$ amp. continuously. The use of 20 amp. fuses is indicated for these 10 kva. units.

Due to continuous duty, capacitor service is severe on fuses and switches. These fuses frequently fail because of terminal contact heating. Fuse and switch contacts must be kept clean and tight. Clip clamps are commonly employed to insure tightness.

To correct the trouble reported, first be certain that fuse contacts are tight and clean. Next measure the current in each of the three leads to each capacitor that blows fuses. This current should be balanced, and should vary with the applied voltage. Harmonic frequencies and resonance occasionally overload capacitors but are probably not the cause of blowing these 30 amp. fuses.

Since the value of capacitor equipment is increased by its continuous operation at full rating, the current in each

main lead should be measured at least monthly. Such readings are a reliable index of the capacitors condition. As stated before, bad fuses, overheated connections and bad switch contacts must be watched for; and connected before trouble develops. In hot locations, unless oversize, type R insulated wire may age rapidly. Before working on a capacitor be certain that it is discharged, either automatically through its resistors, by being shorted, or by grounding each of the three main leads.

Capacitors require but little servicing. They should be kept clean, particularly the bushings and bus insulating supports. Although capacitor losses are only $\frac{1}{3}$ of one per cent, 440-volt capacitors should not be operated at room temperatures above 40° C. unless approved by the manufacturer. High temperatures will decrease a capacitor's life, and cause high losses.

Capacitors installed near the ceiling in warm rooms are likely to be subjected to unduly high ambient temperatures.—R.B.G.

A. TO QUESTION 44. Test the line-voltage at the 200 amp. safety switches, with and without the capacitors connected.

The capacitors may be raising the line-voltage too high (above 440 volts) thus increasing their capacity and current. If this is found to be the case, I would suggest changing transformer taps to lower the line-voltage to compensate for the voltage rise due to capacity effect.

This condition may also be periodic due to the systems varying power factor. The fuse ratings may be slightly increased without damage.—L.H.M.

A. TO QUESTION 44. Under normal conditions, there are approximately 76 amperes flowing through each of the three capacitor units forming a bank. For each phase of a bank of the three-phase capacitors there are approximately 457 microfarads capacity. These brief calculations based on a pure sine wave-form e.m.f. further show that the fused 200 ampere switch carries 131 amperes. The fused 30 amp. individual capacitors each of 45 microfarads carry less than 8 amperes.

Abnormal line conditions may be a cause of the trouble. Very poor feeder regulation is also a cause. If this is so, the same condition may be observed on all the banks. There is also a possibility of a defective discharge resistor and increased individual losses. Capacitors, however, are generally reliable and require no more maintenance than a transformer. Why not replace the 200 amp. fuses with at least 250 amp. fuses of good inverse time limit characteristics?—O.A.

HI-POT TEST FOR USED MOTORS

QUESTION 45. If new windings in electric motors should successfully stand a high potential test of twice normal voltage plus 1000, what is the proper value to use for motors that have been operating for some time, the motors being thoroughly clean and dry?—R.C.M.

A. TO QUESTION 45. If motor voltage does not exceed 600 volts, test for resistance first with the following formula:

$$R = \frac{V}{kva + 1000}$$

R = resistance in megohms

V = terminal voltage

Kva = rated capacity

If motor fails to give required resistance it should be cleaned and dried and above test repeated. This will indicate if motor will stand normal breakdown test. If motor is on important duty it should not be used if it does not meet the above test; if on secondary duty it could be used if megohms test does not fall lower than 30 per cent in first test and a breakdown test of not more than double voltage.—W.G.

A. TO QUESTION 45. If a motor is clean and dry its insulation resistance to ground while cold should not be less than the following:

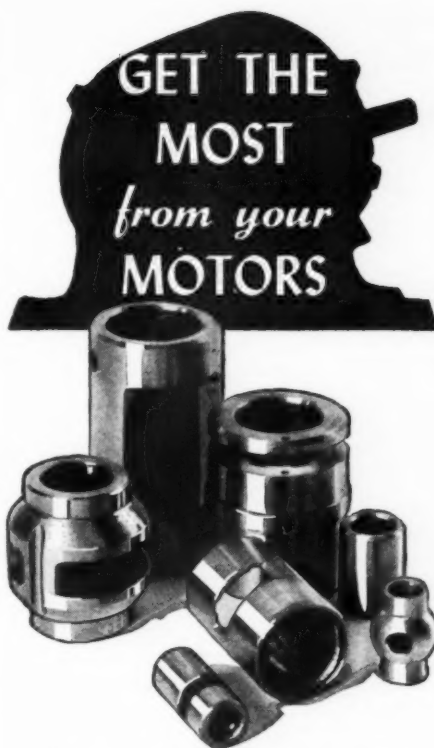
Motor Voltage	Megohms
110	0.30
220	0.60
440	0.80
550	1.20

Assuming that the insulation resistance is not less than shown above, and that it is in good condition, $\frac{1}{2}$ rated voltage plus 1000 volts at 60 cycles applied for one minute should not cause breakdown.

Because insulation resistances indicate, within reasonable limits, the condition of a motor's insulation, and since such measurements do not damage insulation, breakdown tests are not generally applied to old motors.

Where service requirements are so severe as to justify high potential tests the insulation should be expected to safely withstand the standard test of twice the rated voltage plus 1000 volts.—R.B.G.

A. TO QUESTION 45. Testing procedure including the choice of the dielectric test voltage value should be decided by the maintenance engineer based upon the condition of apparatus in service. In general, however, the



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490 S. MILL STREET • NEW CASTLE, PA.

Install JOHNSON Leaded Bronze BEARINGS

In order to get the maximum power from a motor, it is necessary to have it equipped with bearings that assist... not retard it. The special high-lead bronze in Johnson Bearings enables the motor to operate at full efficiency. Johnson Electric Motor Bearings are available from stock for more than 250 different motors. Try a set on your next overhaul. Check them and see if they don't enable you to get the MOST from your motors.

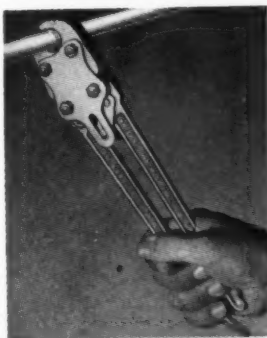


What a DIFFERENCE !



And there's just as much difference between the streamlined BRIEGEL METHOD of making connections and former old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials allowing you a larger margin of profit on each job. Make quick, easy, strong and neat connections this MODERN way.



No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only \$1.25) and you have a smooth efficient job.

Approved by Underwriters Laboratories.

DISTRIBUTED BY

The M. B. Austin Co.
Chicago, Ill.
Clayton Mark & Co.
Evans' on, Ill.
Clifton Conduit Co.
Jersey City, N. J.
General Electric Co.
Bridgeport, Conn.

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National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
Elmhurst, N. Y. C.

BRIEGEL METHOD TOOL CO., Galva, Ill.



Precision machining is the reason why electrical men are turning to "Gorilla Grip" Mechanical Connectors.



Each terminal unit of every connector, lug or tap is machined to an exact wire or cable dimension. Only one size wire will fit each unit. There are no loose or hot connections with "Gorilla Grips." The terminal units are machined to fit many types of bodies but at the wire entrance, where it is important that you have a good contact, only one wire size will fit.

National Electric
PRODUCTS CORPORATION
1000 FULTON BUILDING, PITTSBURGH, PA.

Reader's QUIZ

[FROM PAGE 71]

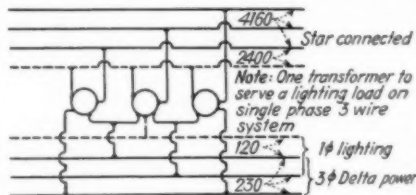
test voltage should not exceed 65 per cent of the factory a.c. test voltage of twice normal plus 1000 between winding and ground for periodic dielectric strength tests and 75 percent for used or repaired apparatus.

In making dielectric strength tests, it is advisable to precede and follow each test with an insulation resistance test. This may be done either by using a 500-volt megohmmeter.—R.G.C.

Can You ANSWER these QUESTIONS?

QUESTION Z1. The accompanying diagram shows a bank of transformers, star connected primary, delta connected secondary, with a tap for single phase three wire lighting on one transformer.

For a 30 kva. power load and a 15 kva. single phase, three wire lighting load, what



size should each transformer be, how would you calculate it and what sizes would be required?

The transformers were connected star to star, the high side of the transformers are connected to 4160 V. star, 2400 V. to ground.—C.P.L.

QUESTION A2. Why are the conductors of a twin conductor extension lead used for connecting a thermocouple to a pyrometer of different kinds of metal and what would be the objection to using a two conductor copper wire?—J.J.L.

QUESTION B2. On a generator for charging a 50-volt locomotive battery, when the battery was almost fully charged the polarity of the generator was going to reverse? How can I remedy this condition? We have no spare.

Our generator was a d.c. shunt motor, 5 hp., 115 volts, 38.8 amps., 1100 r.p.m., coupled to an a.c. motor 7½ hp., 1175 r.p.m. The battery was in series with two parallel resistances of 3.35 ohms each. When we first connect the battery the generator charges at the rate of 25 amps. at 90 volts.—C. B.

PLEASE SEND IN
YOUR ANSWERS BY MAY 1

For Better Service -

INSTALL **TRICO** REG. U.S. PAT. OFF.

RENEWABLE FUSES
With the famous Powder-Packed Element

KLIPOK CLAMPS
Lock fuses and clips together

KANTARK FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
The color tells the size

FUSE PULLERS
Pull and replace fuses safely

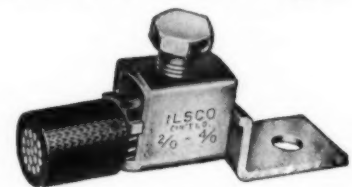
OILERS
Glass and Unbreakable types for every application. Stops guesswork - bearing failures - waste - idle machinery, etc.

WRITE FOR FOLDER No. 300

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

ILSCO SOLDERLESS CONNECTORS

HAVE YOU TRIED
The New IlSCO Lugs?



BUILT FOR OVERLOADS!

The new design—as passed by the Underwriters' Laboratories May 1, 1940.

GENTLEMEN

Send me New Catalog and Sample

Name

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City & State

MAIL
COUPON
TODAY

ILSCO COPPER TUBE
AND PRODUCTS, INC.
5629 MADISON ROAD — CINCINNATI, O.

NISA Looks Ahead

[FROM PAGE 26]

the motor shop industry both national and state, advising members also on new problems of taxation and insurance.

9. Employees Training. A practical course for Employees Training especially intended for developing skilled workers is one of the most valuable NISA activities at the present time.

10. Local Chapters. NISA has sponsored many local chapters throughout the country. Through these local groups a genuine spirit of understanding and cooperation has been developed and this has played an important part in elevating the ethics and standards of practice throughout the industry.

These are but bare outlines of only a few tangible NISA projects. They add up nevertheless to a substantial and worthy program for these times. Together they are also evidence of the essential source of experience, counsel and data that NISA is in normal times, a source suddenly become many times more valuable as all-out war production calls for our best efforts and the mobilization of every resource.

Our convention in Cincinnati will bring together a group of men whose problems today are like yours and mine. Never in our business lives has it been so important to have this privilege of meeting together, of sharing ideas and plans, of discovering new methods and opportunities. If we are to serve our country and our industry today each of us has the responsibility of adopting the best methods our industry knows. And from the broad experience, the sound judgment and the knowledge of many men of common purpose and good will, who will gather in Cincinnati next month, each of us can benefit.

GLIMPSES OF OURSELVES



The service life of the best tool or appliance can be "sabotaged" by a flexible cord not suitable for the job, that quickly wears or fails. But matching the cord to the service is no problem—because Roebling offers 8 different types of rubber-jacketed flexible cords alone—each exactly suited to a specific type of service—as outlined below.



SUPER QUALITY—60% RUBBER JACKET

ROECORD TYPE S—For use in machine shops and out-of-doors where *extra long life* and resistance to moisture, abrasion, kinking, impact and tension are required.



ROECORD TYPE SJ—For pendant and light portable use in offices and similar places indoors where *extra long life* is desired.



UNDERWRITERS GRADE

ROEBLING TYPE S—Same services as Roecord Type S under ordinary conditions of moisture, abrasion, kinking, impact and tension.



ROEBLING TYPE SJ—Two types—*constant service*, similar to Roecord SJ but for less severe service; and *stationary service*—a less flexible cord for equipment which is seldom moved.



SPECIAL APPLICATION CORDS

ROILCORD TYPE SO—A heavy duty flexible cord with Neoprene jacket for use on screw machines and where there is considerable exposure to oils, acids or sunlight.

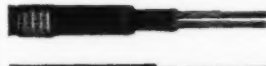


ROILCORD TYPE SJO—Same as Roilcord Type SO except this is for less severe service.



LIGHTER SERVICE CORDS

ROEBLING POSJ—Parallel cord with separate rubber sheath—for lamps, clocks, radios, refrigerators, etc.



ROEBLING TWINSPLIT, N.E.C.—Parallel cord with combined insulation and jacket—for lamps, clocks, radios, etc.



JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY • Branches and Warehouses in Principal Cities

Estimating

ESTIMATING GUIDES

—The Take-off and Pricing

The first item in this series of "Estimating Guides" as outlined by the Electrical Contractors Association of the City of Chicago, stressed the importance of carefully recording and studying all plans and specifications that accompany any specific job.

Once this is done, the estimator faces the laborious, yet most important task of material take-off, listing and pricing. Extreme accuracy in this particular phase of the job often means the difference between losing or getting the contract; or the difference between the profit or loss on the job. Today it is especially important since material conservation is one of the backbones of our war program.

However, before going into the take-off procedure it might be well to point out that, for an average building, the electrical estimate should have a separate division for each of the following systems:

1. Service and feeders (divided according to size and type of project).
2. Switchboards, panels and cabinets.
3. Power branch wiring and motor connections.
4. Lighting branch wiring.
5. Lighting fixtures.
6. Special systems.
7. Job costs (tools, shops, etc.)

Although the discussion immediately following will cover take-off and listing in a general manner, detailed suggestions bearing specifically on each of the sub-divisions mentioned above will be made in future items.

TAKING-OFF QUANTITIES—For the present let's consider a few general rules on how to take-off quantities. These rules shape up somewhat as follows:

1. Use good estimating forms.
2. Take off each system separately and complete one system before going to another.
3. Arrange the take-off for easy division of the bid and alternates.
4. Have a neat set-up and avoid crowding data and figures.
5. Check the take-off to see that typical

floors and half plans have not been overlooked.

6. Check measurements to see that the proper scale has been used.

LISTING AND PRICING—After quantities on all systems have been taken off, the various sheets must be summarized and transferred to a pricing sheet. The following rules apply to this phase of the estimate.

1. Use good pricing forms.
2. List each system separately.
3. List materials and labor in the order which will best facilitate checking.
4. Check items, on the take-off sheets, as they are listed on the pricing sheet.
5. Designate unit of pricing (each, per 100, etc.).
6. Avoid crowding. It is well to leave space between groups of items.
7. Delay extensions until all unit prices on the sheet are filled in. This will minimize errors.
8. Underscore special items with colored pencil (L.C. wire, etc.).
9. Check mark all blank spaces that are not to be filled in with prices.
10. Summarize each sheet separately, then transfer totals to a final summary sheet.

CHECKING ESTIMATES—All estimates should be prepared so that a careful check can be made in the minimum amount of time. Some of the points that may be checked are listed below:

1. Check accuracy of quantities.
2. Be sure all systems are covered in the estimate.
3. Check all plans and specification notes.



CONSULTATION over the electrical work on one of Uncle Sam's ordnance plants. A. S. Schulman (left) of the A. S. Schulman Electric Co., Chicago, shows his son Harry some of the finer points about electrical construction. A. S. has been in the electrical game since 1883.

Check off each note as the particular item is covered in the estimate.

4. Check pricing sheets for accuracy in:
 - (a) Pricing—every space should have a price or a check mark.
 - (b) Extension
 - (c) Decimal points
 - (d) Additions
 - (e) Transfer to summary sheet

The remaining items of this specific series will cover take-off and listing of the various system divisions mentioned earlier in this discussion.

PRESS WIRING

Further data on labor hour costs of installing printing press wiring is presented in the following tables. This material is a continuation of the tables which appeared on pages 62 and 64 of December *Electrical Contracting*.

As in the first group, these tables present the distribution of man hour labor costs for typical press motor installations and control wiring. The material quantities are typical and in applying these figures the estimator should make whatever allowances are necessary for deviation from the amounts shown.

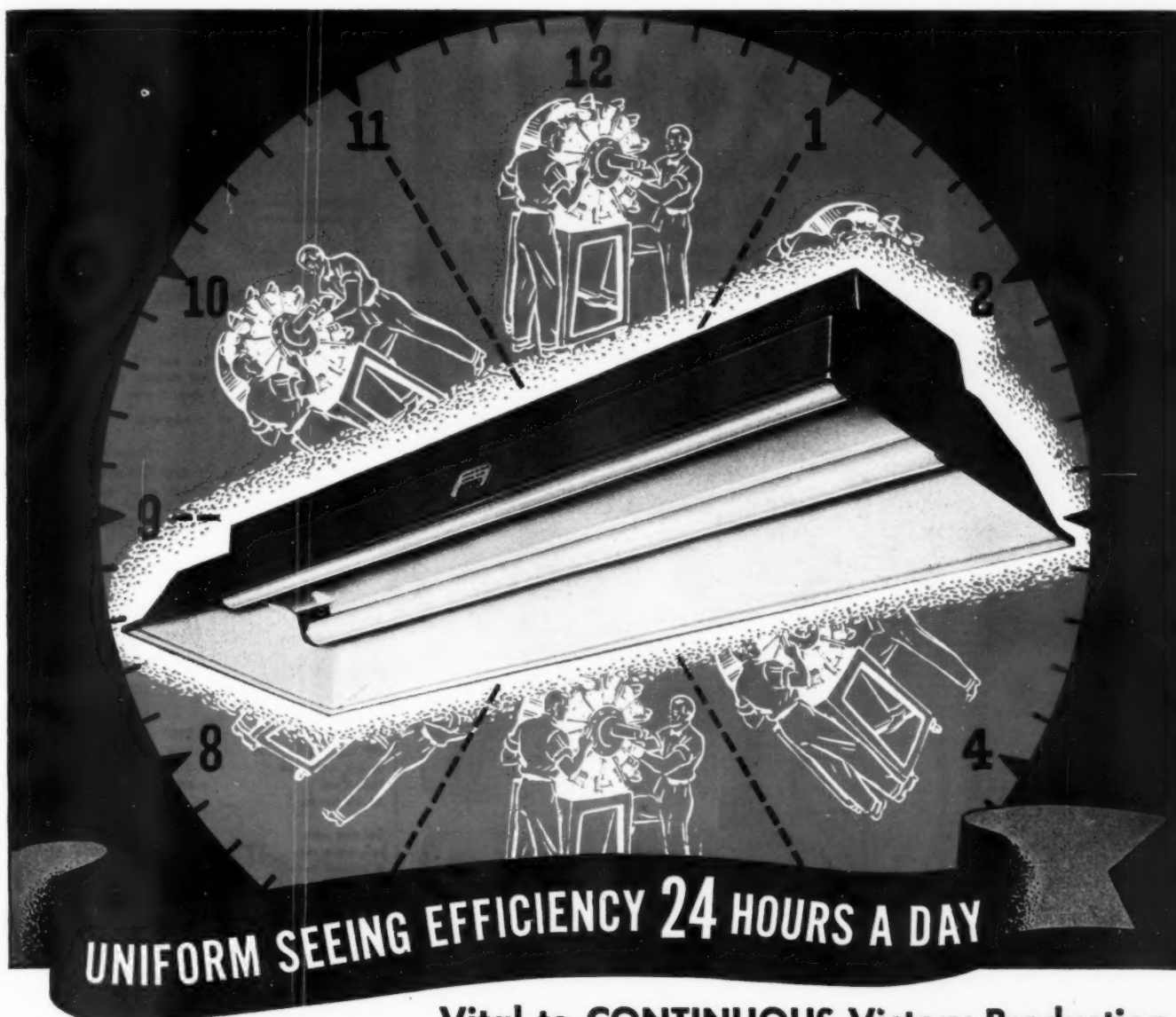
Under each table, additions for typical controls and associated equipment are shown as a lump sum. The breakdown of these figures appeared in Tables 3, 4, 5 and 6 with the original data.

The figures given represent actual time plus a percentage for supervision, lost time, materials, handling and other factors affecting the total payroll.

TABLE NO. 7

Typical installation 150 hp. and 10 hp. 220 volt, 60 cycle, 3 phase motor control stations, sheet cutter, signal light, etc. using R.H. 75 deg. C wire.

	Material	Labor Man Hrs.
	Quantity	
Service feed	310' — 750,000	30
100' run	100' — 3 1/2" cond.	44
Unit Cost	2 — 3 1/2" els	6
\$9.10 per ft.	1 — 600A sw	12
	1 — 6C P C	10
		102
Connecting 150 HP slip ring motor, 100' run	310' — 750,000	24
Unit Cost	310' — 4/0 B&S	12
\$8.00 per ft.	90' — 3 1/2" C	40
	90' — 2 1/2" C	16
	Els, etc.	12
		104
Connecting 10 HP slip ring motor	310' — #8 wire	3
100' run	310' — #10 wire	2
Unit Cost	90' — 1 1/4" cond.	8
\$.90 per ft.	Els, etc.	3
		16
Set and wire self con. res. & control panel	60' — #0 F.P.	30
		84
	TOTALS	336
Add for typical:		
Press control wiring		370
4 — Paper reels		192



Vital to CONTINUOUS Victory Production

● In aircraft factories, ordnance plants, shipyards, steel mills . . . wherever vital defense contracts call for fast, accurate, continuous output . . . adequate levels of light ranging from 25 to 75 foot-candles or more are required. By increasing the ease and speed of seeing, reducing eye-strain and fatigue, adequate light makes sustained effort and peak efficiency possible on all three shifts . . . and in every part of a plant.

Assurance that you will secure the maximum in lighting performance and economy from a lighting unit depends largely upon basic design and construction factors.

When you purchase Lighting Units bearing the RLM LABEL you know that exacting laboratory and engineering

tests have proved that they (1) Conserve light and power; (2) Stand up under the vibrations and heavy-duty service of producing machinery; (3) Require a minimum of time and cost to maintain at their original lighting efficiency; (4) Have uniform quality. Write for booklet, "The Meaning of the RLM LABEL."

Only Industrial Lighting Units built to exacting RLM Specifications, and certified by Electrical Testing Laboratories are permitted to carry the RLM LABEL.



The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE

INCORPORATED

307 N. MICHIGAN AVE. SUITE 1600 • CHICAGO, ILL.

THE CERTIFICATE OF UNIFORM QUALITY

Guarantee

This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributor.

GET EXTRA MAN POWER WITH GREENLEE BENDERS



**EASIER
AND FASTER**

**ONLY ONE MAN
TO OPERATE**

**LIGHT, PORTABLE
EASY TO SET UP**

**POWER TO BEND
1 1/4" - 4 1/2" PIPE**

**SAVE COST OF
MANUFACTURED BENDS**

As good man power becomes scarcer in the present emergency, increase the efficiency of your men by turning to a better use of tools. Let Greenlee Benders help you speed up construction by making the work easier and faster for the man on the job. Greenlee Benders are daily saving contractors on defense jobs from 15 to 75% in time and labor costs.

THERE'S A GREENLEE BENDER FOR EVERY JOB

Whatever you have to bend . . . tubing, conduit, pipe, or bus-bars . . . there is a Greenlee Bender to do the job easier and faster. Small hand benders will bend copper tubing from 3/8 to 1 1/8 inches and steel, copper, brass, and aluminum tubing from 1/4 to 3/4 inches. Powerful Greenlee Hydraulic Benders are available for bending 1 1/4 to 2-inch thin-wall conduit, 1 1/4 to 4 1/2-inch rigid conduit and pipe, and for bus-bar up to 4 inches wide and 3/4 inches thick.

These benders are all readily portable, easy for one man to operate, make smooth, even bends without distortion, and eliminate the need for many costly fittings and manufactured bends. Find out how Greenlee Benders can save vital hours on your defense jobs . . . write for Bender Booklet S-116.

SEND FOR
FREE COPY OF
BENDER BOOKLET
S-116

Greenlee
TOOL CO.

1744 COLUMBIA AVE., ROCKFORD, ILLINOIS

Estimating

[FROM PAGE 74]

Automatic tension	180
Automatic paster	270
TOTALS	1348

TABLE NO. 8

SHEET 86

Typical installation 200 hp. and 15 hp. 220 volt, 60 cycle, 3 phase motor control stations, sheet cutter, signal lights, etc., using R.H. 75 deg. C wire.

	Material	Labor Man Hrs
Service feed	620' — 500,000	36
100' run	200' — 3" cond	70
Unit Cost	4 — 3" ells	8
\$12.60 per ft.	1 — 800A sw	10
	1 — 8C P C	10
		134
Connecting 200	620' — 400,000	30
HP slip ring	310' — 250,000	14
motor, 100' run	200' — 3" cond	70
Unit Cost	100' — 2 1/2"	18
\$11.45 per ft.	Ells, etc.	16
		148
Connecting 15	310' — #6 wire	4
HP slip ring	310' — #8 wire	3
motor, 100' run	100' — 1 1/2"	10
Unit Cost	Ells, etc.	5
\$1.10 per ft.		22
Set and wire	60' — 2/0 F.P.	32
self. cont. res.	Supports	98
& control panel		
	TOTALS	434
Add for typical:		
Press control wiring		370
4 — Paper reels		192
Automatic tension		180
Automatic paster		270
	TOTALS	1446

COST CHART

A handy chart for approximating 220 volt, 3-phase motor circuit wiring costs was prepared on the basis of two methods. One set up average feeder and branch circuit quantities and specification from a number of industrial jobs for several motor sizes. A curve was then drawn showing the relationship between motor horsepower and cost for labor and materials. Curves representing rough cost formulas were drawn on the same coordinates.

The rough cost formulas are rule of thumb approximations of a type frequently used by estimators as a check. They are made up separately for material and labor as follows:

Material

$$10 + 4h = \text{Cost in dollars}$$

Labor

$$13 + 2h = \text{Cost in dollars}$$

when h = motor horsepower

As the chart shows, the costs repre-



HOLD IT, PLEASE

and before you decide, be sure that you know about

THERM-A-TRIPS

(fuses with thermal cutout)

They avoid needless shutdowns — so costly in these times — by a long, safe time-lag which allows motors to start and run on normal overloads. And they provide full, positive protection by blowing on excessive overloads and on short circuits. They can be instantly replaced, require no attention, occupy a small space, and are inexpensive, since no other overload protection is needed. No moving parts,

no mechanism to set, nothing to get out of order. Cartridge type, 250 and 600 volts. Ask your dealer about THERM-A-TRIPS today, or write for our Bulletin 405.



**THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS**

FUSE MAKERS SINCE 1893

The FIRST Real Starter for Starter Sales



For the First Time Fluorescent Starters
Reach the Limelight in

LLOYD STARTER DISPLAY No. FS-24

With 10 FS-2 and 10 FS-4

Lloyd Guaranteed Fluorescent Starters
Approved by Electrical Testing Lab., Underwriters'
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It's colorful. It puts starters in the front
lines. Will definitely sell more of these
widely advertised Lloyd starters... the
BIG REPEAT ITEM in the fluorescent
field. Use this display. Make more sales!



ORDER TODAY
DISPLAY WITH 20 STARTERS
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LLOYD POLICY INSURES QUALITY

LLOYD PRODUCTS CO.

Box C - Edgewood Station, Providence, R. I.
Representatives in 22 Leading Cities
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Lloyd
Twist Type
Lamp Holder
with
Starter Socket
Blk. Cat. 353
Wht. Cat. 353-W
Combined with
Starter Socket
Cat. 252
Pats. Pend.



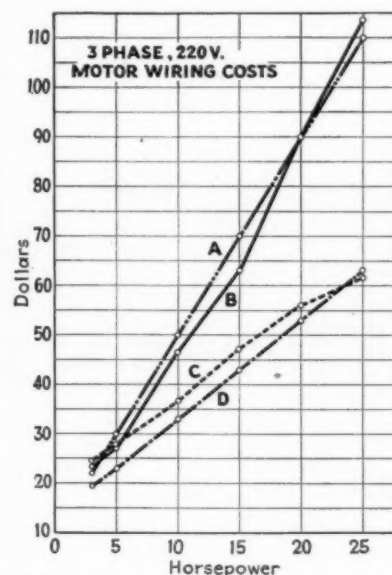
Lloyd
Push Type
Lamp Holder
with
Starter Socket
Blk. Cat. 253
Wht. Cat. 253-W
Combined with
Starter Socket
Cat. 252
Pats. Pend.

Estimating

[FROM PAGE 76]

sented by the formulas are, on the average, high for material and low for labor with respect to the curves based upon more detailed estimating methods. However, for rough estimates the deviation is not too great and used together the differences tend to cancel out.

The comparison offers the suggestion that many check figures on electrical installations could be expressed graphi-



MATERIAL AND LABOR cost curves,
(A) material approximated by $10 + 4h$
= cost, (B) material by detailed esti-
mate, (C) labor by detailed estimate and
(D) labor approximated by $13 + 2h$ =
cost.

cally and relatively simple cost formulas
worked out. And even accurate cost
data may be represented in this form
when there are not too many other va-
riables to consider. Such curves and
formulas are not common in estimators
notebooks. It may be that they could
be used more extensively as a contribu-
tion to accuracy and time saving.

Data from A. J. Allyn, Chicago, Illi-
nois.

Permit Material Substitutions

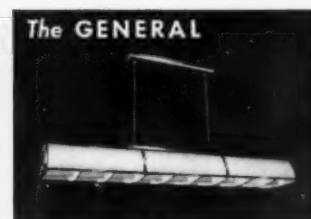
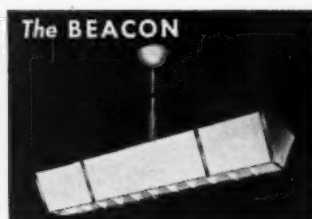
A City Council ordinance in Colorado
Springs, Colo., now gives full authority
to electrical inspector, V. D. Markham, to
permit wiring material substitutions, pro-
viding no breakdown in the present high
standards of wiring in the city will result.

Out in Pueblo City, Colo., a recent or-
dinance authorizes a board composed of
the city engineer and his assistant, plumb-
ing inspector, electrical inspector William
H. Hart and the building inspector, to act
on material substitutions for new construc-
tion or repairs. This is for the duration of
the war.

How you can get

★ ***FASTER*** ★
DELIVERY

on Wakefield Fluorescent units . . . even on priority orders

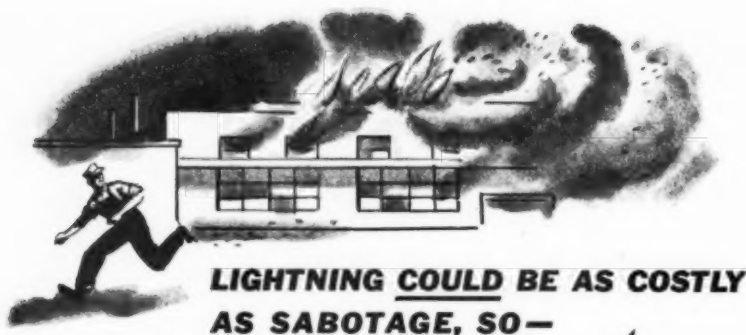


SPEED OF PRODUCTION — and speed of delivery — starts with the specifications. When you get a customer to plan his job for, and to specify, *standard* Wakefield Fluorescent units you save time for the customer, for yourself and for us.

Every "special" job means time for setting up machines, time for resetting them for standard production. It may mean delay, not only for his order but, later delay on service, as well as delay for other orders.

Today, time is important. Do your part to help make time do more for us all and get faster delivery on your orders.

★ THE F. W. **WAKEFIELD** BRASS CO. ★
42 CONTRACT PARK VERMILION, OHIO



West Dodd

STANDS ON GUARD!

★ West Dodd Lightning Protection and static control equipment is standing guard over many plants vital to the nation's war effort, providing protection against something that could be as costly as sabotage. Over ammunition loading lines, over powder igloos and on shell loading plants. Over power stacks, and often the factories, where fighting tools are being forged.

Many items of West Dodd materials have been specially designed to meet U.S. Government specifications and requirements. Inspected and labeled in the plant by Underwriters' Laboratories. Approved by American Institute of Electrical Engineers.

Prompt delivery and complete cooperation on the job have earned for West Dodd commendations like

that of W. W. Clark, President of The Dingle-Clark Company, contracting engineers of Cleveland, who writes: "—I really feel that we, as a company, performed a real service to the country in the operations we carried on at — Arsenal. Your cooperation with us played an important part in our ability to furnish vital parts of this job on time..."

WEST DODD
LIGHTNING CONDUCTOR CORP.



FREE The West Dodd Engineering Dept. will be glad to assist in planning application, or estimating costs.

**Wiring A
Laboratory**

[FROM PAGE 21]

The laboratory building is served from a bank of 3-200 kva., Pyranol filled transformers connected 2300-volt delta to 220-volt delta. A neutral tap is taken off one transformer for a small 110 volt load. Lighting is on 220 volt, single phase circuits. The service feeders from the power plant are two 3/0, 3 conductor, 3500 volt steel taped cables buried three feet in the ground with 2 by 10 creosoted timbers over the cables for protection. Normally only one cable is in service, but disconnecting type potheads permit easy changeover to the spare cable. The feeders from the transformer to the main power and lighting switchboard consist of four 2600 ampere enclosed buses.

The main switchboard, approximately thirteen feet in length, is located on the basement floor in the center of the building and extends from wall to wall. The front and rear of the board are accessible at all times and sufficient space is provided for any needed future extensions. The switchboard is dead front construction and was manufactured by Wm. Wurdack Electric Mfg. Company of St. Louis, as were all other switchboards, special laboratory equipment and the thirty-three panelboards of various types on this project. The many unusual features of design and installation required close collaboration between the Wetherbee Electric Company, architects and the panelboard manufacturer.

The entire project required, because of the many special laboratory circuits, approximately four times as much conduit and wire as a conventional building of the same size. The heavy wall conduit totalled over 50,000 feet in sizes from 1/2-in. to 3-in. and the wire footage totalled approximately 150,000 feet.



FUSE SESSION evolves as J. S. Mahan (left) Fustat Manufacturers, discusses Type S fuses with H. N. Smith, Continental Insurance Co., and F. F. Sengstock, Economy Fuse and Mfg. Co., at recent meeting of Illinois Chapter IAEI

G-E CONDUIT

Is Shipped Easily

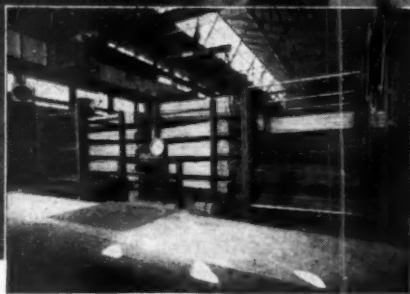
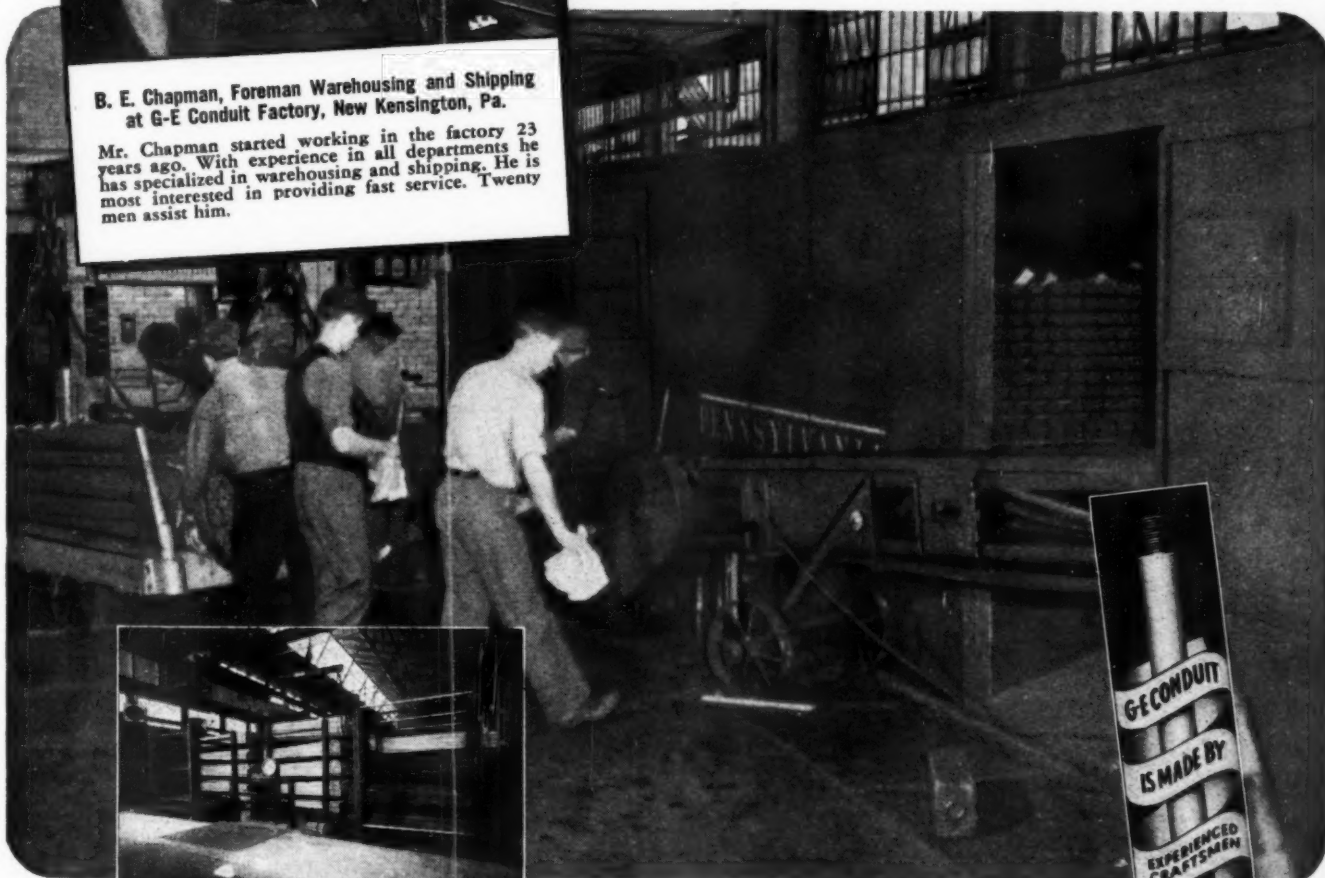
From Modern Stock Room

No. 8 of a Series—Men and Processes Behind G-E Conduit



B. E. Chapman, Foreman Warehousing and Shipping at G-E Conduit Factory, New Kensington, Pa.

Mr. Chapman started working in the factory 23 years ago. With experience in all departments he has specialized in warehousing and shipping. He is most interested in providing fast service. Twenty men assist him.



(Left) Storage Racks.

(Above) Conduit Being Loaded.



THE outstanding storage and shipping facilities of the G-E conduit factory at New Kensington, Pa., enable good service to be given to customers. Inside car loading facilities permit R.R. cars to be loaded quickly and expertly.

Five-ton bundles of conduit are stored separately on self-supporting racks—an exclusive G-E arrangement. This storage method protects conduit from damage it suffers when stored in large bins. The conduit is transferred by overhead crane from the storage racks to the car loading platform and conveyor. During car loading laths are placed between rows of conduit to prevent damage and to keep it from shifting. The men who handle the storage and shipping of G-E conduit have had long experience at their jobs. They know how to store conduit carefully and how to handle it for quick service to customers.

For further information about G-E conduit see the nearest G-E Merchandise Distributor or write to Section C-284, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

Questions ON THE Code

Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Type of Rubber in Service Cable

Q. "What type of rubber insulation is used on conductors of No. 6 and No. 8 SE and ASE Service Entrance Cable, Entrance Drop Cable? The Code does not give the ampere rating of this cable."—C. W.

A. The rubber insulation on the conductors of service entrance cable may be of type R, RP, or RH.

The carrying capacity of the cable is found in Table 1, under the type of rubber insulation used. Note that the sub-heading of Table 1 indicates that it is for "Not More Than Three Conductors in Raceway or Cable" and that the sub-heading for Table 2 indicates "Single Conductor in Free Air."

Connecting a Capacitor

Q. "In connecting a capacitor in a line does it increase the kw. load of the line?"—M.Z

A. Where a transmission line has poor voltage regulation and a poor power factor, the connection of a capacitor of the proper capacity does not increase the kva. load on the line but may permit additional load to be put on the line. Of course the capacitor of proper capacity must be selected for the particular conditions encountered.

Mixing Armored and Unarmored Cables

Q. "We have been having a few talks in our wiring class about whether or not we could use BX cable and Romex together in house wiring. I would be very thankful if you would tell me if and where we could use BX cable and Romex together."—S.S.S.

A. Armored cable and non-metallic sheathed cable are both approved methods of wiring and there is no rule in the National Electrical Code which prohibits the use of both materials in wiring a house. Such a mixture is hardly to be recommended but would be permissible provided no rules were violated.

But there are several things to keep in mind. With the armored cable, grounding of metallic outlet boxes and wiring device enclosures and of fixtures are really automatically taken care of, while with the non-metallic sheathed cable it may be necessary to run a separate grounding conductor.

The following sections of the Code must be kept in mind; Section 2533, which requires grounding of cable armor in runs of less than 25 feet if the cable is not free from probable contact with ground or grounded metal; Section 2543, which requires grounding of metal boxes used with armored cable, or on non-metallic sheathed cable where metal or metal lath is used; and also 2559, which prohibits grounding the equipment to the grounded circuit conductor.



HERE'S THE ANSWER says John P. Moore, electrical inspector of City of Chicago, as he points to his Code book. Inquisitors are Elton Gould (left), Herb Binner and Ed Wigdahl, all officers of the Cook County Electrical Contractors Association, Chicago.

Service Switch Problem

Q. "In designing a layout for a sq. cage 25 hp. 550 volt 3-phase motor, I faced a problem of the service switch. Could I use a 60 amp. 550 volt switch on 100 amp. 550 volt switch?"

"According to the Code the branch circuit fuse would be 80 amps. Therefore it could not be inserted in 60 amp. clip, so I plan to use 60 amp. renewable fuses with 80 amp. fuse elements. Do you think this would be within the Code?"—M.Z.

A. The service switch for this should be of the 61-100 amp. 550 volt capacity so as to accommodate the 80 amp. fuses required for the motor branch circuit protection.

It would be highly improper to use an 80 amp. refill in a 60 amp. renewable fuse cartridge.

Outside Handle on Locked Service Switch

Q. "Where outside service terminates directly in a lockable distribution panel with more than six circuits and equipped with a main switch, is the main switch, which is located in the panel, required to have a handle which is operable when the panel is locked?"—B.A.H.

A. The first and basic rule governing the service switch is in Article 230, Services under "Disconnecting Means" Section 2351, which requires that "Each set of service-entrance conductor shall be provided with a readily accessible means of disconnecting all conductors from the source of supply".

The intent of this is that the service switch must be capable of being quickly and easily reached in an emergency. If the switch is to be locked within a cabinet then there should be some means provided for operating the switch without having to use a key to unlock a door. For this purpose an external handle is provided.

Certainly a switch which is locked up is not readily accessible.

Therefore, if the cabinet in question is to be locked and if the main switch is to serve as a service switch, the switch should be operable from the outside without having to unlock the door. And Section 2356 does not abrogate this requirement. In fact, this section (2356) does not say anything about the external handle although a reading of it without referring to the definition of "Externally operable" makes it appear to. (Just a case of where certain words are given a foreign meaning.)



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We've designed this high-candlepower luminaire to assure effective, night-after-night protective lighting. SG-10 is typical of Westinghouse *engineered seeing*—the combination of scientifically designed fixtures expertly applied to achieve the best visibility conditions. Full data is available in our new Protective Lighting Planning Book, B-3085. Write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, O.



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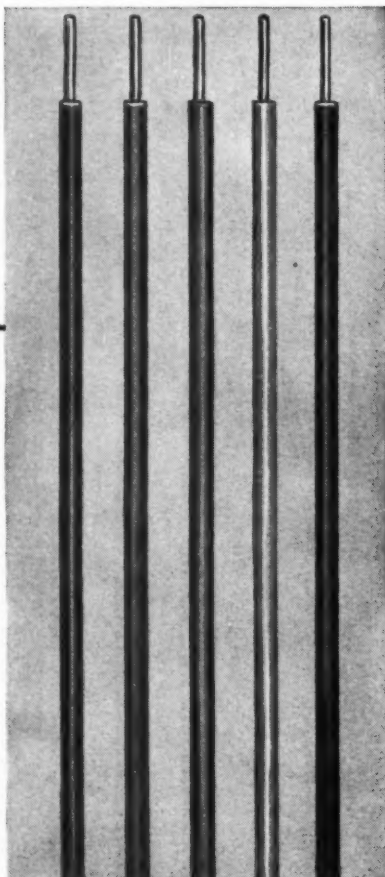
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*Reg. U.S. Pat. Off.

GENERAL  ELECTRIC

*Questions
in the Code*

[FROM PAGE 82]

What the section really does say is this:—A service switch if enclosed within a box or cabinet shall be capable of being operated without exposing the operator to contact with live parts and shall be capable of being reached quickly for operation without resort to climbing over chairs, boxes, stepladders, etc., unless additional enclosed switches, which in turn do not expose the operator to contact with live parts are provided for all feeders or circuits supplied through this service switch.

It really is time that the definition of "Externally operable" is revised to mean what it looks like and that it does mean something about an external handle.

Armored Cable In Cinder Block

Q. "I would very much like your opinion on the following matter: "In this vicinity cinder blocks are used extensively for foundation walls of houses and other buildings. These blocks are very similar to cement blocks with hollow spaces, usually two in the center, and are made of ground-up cinders and some sand and cement.

"For years we have often fished BX cable down through the sill of a house, through the hollow spaces in the blocks, to outlets in the basement. The blocks are not over an inch thick opposite the hollow spaces and boxes can be cut in quite easily.

"Although we have never had any complaint on this method up to date, a new inspector now tells us that BX cable cannot be installed in these cinder blocks on account of corrosion of the metal armor. According to the Code BX cable may be used in the hollow walls of a house and, as these blocks are dry, I can see no reason for an exception being made of the same.

"Sometime after the 1936 flood had covered the basement and first floor of a house for two days we pulled out the BX to some basement outlets installed in cinder blocks and found no trace of corrosion on either the cable or outlet boxes."—C.E.P.

A. The National Electrical Code is not entirely clear on this matter, specially in light of an Official Interpretation (No. 185) on a similar question in regards to unarmored cable.

Section 3342 states that armored cable may be embedded in plaster finish on brick or other masonry, except in wet

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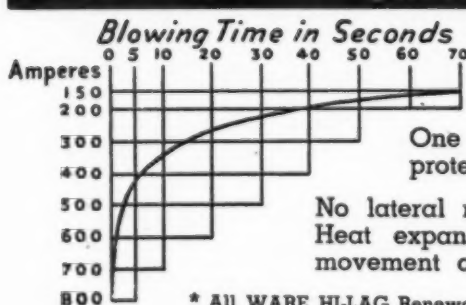
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[FROM PAGE 84]

or damp locations. Outside walls are generally considered to be damp and in some localities all walls are apt to be somewhat damp. In damp locations cinder concrete, being somewhat hygroscopic, presents a sulphurous condition which is very corrosive. Therefore it is best to consider cinder concrete walls, even if of cinder blocks, to be no place for embedding armored cable.

Now as to the use of the hollow spaces in cinder blocks.

Official Interpretation No. 185 rules that non-metallic sheathed cable is not permissible within the hollow spaces of cinder concrete blocks, installed either during the course of construction or after construction.

If such hollow spaces are not suitable for non-metallic sheathed cable they are certainly not suitable for a cable with a ferrous outer covering which would be affected by corrosion.

Therefore, the inspector ruling against the installation of armored cable in cinder blocks is proper in his interpretation of the Code.

CORRECTION

In the Official Interpretations issued as Part Two of the January News-Bulletin, there are two errors: the first Interpretation No. 181, was issued on the 1937 code and the references were not changed. The caption should read "2571" instead of "2552", and the references in Question 2 should read "2551, 2571, or 2572."

Interpretation No. 211 should refer to section 3705 rather than to section 3708 as printed.



REA PROBLEMS occupy leisure moments of (L to R) Cecil Rowley, REA electrical inspector, Macomb, Ill.; James Kerr, electrical contractor, Shelbyville, Ill.; and W. R. Paluska, REA electrical inspector of Eureka, Ill. They trekked to the Windy City to attend the recent meeting of the Illinois IAEL.



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carry on

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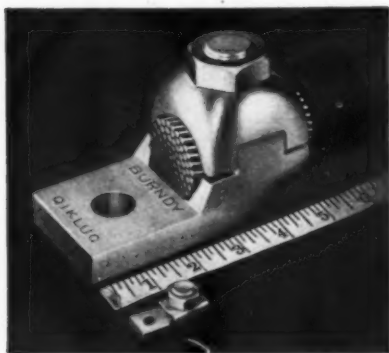
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EQUIPMENT *News*

Terminal Connector

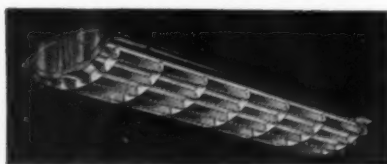
A new, cast Qiklug for electrical cable terminal connections is now available. This terminal connector takes a wide range of conductor sizes, is compact and provided with serrations on cable clamping elements on all but very small sizes. Eleven sizes of Qiklugs are needed for all conductor sizes from No. 14 sol. to 2000 MCM. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.



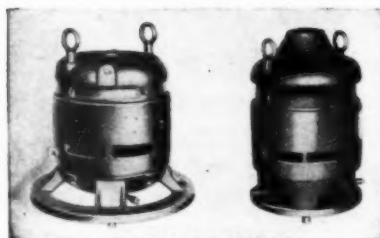
BURNDY QIKLUG

Lighting

The Guth Trucolite is now available with eggcrate louvres or diffusing glass bottom. The new louvres permit strong downlight with comfortable shielding. The glass shield is prisms glass which diffuses and transmits the light yet gives a low surface brightness. Glass shield is held in a metal frame, braced by two rods. Both the glass and eggcrate bottom have a drop-hinge for relamping, cleaning and servicing. The Trucolite end has been redesigned so that the eggcrates or glass can be added to the open type whenever desired. End has knockouts for tying fixtures together in continuous runs. Edwin F. Guth Co., 2615 Washington St., St. Louis, Mo.



GUTH TRUCOLITE



G-E TRI-CLAD MOTOR

Motors

Three new motors have been added to the Tri-Clad line,—a vertical general purpose polyphase motor; a vertical shielded polyphase motor (1 to 20 hp.) and a vertical shielded single-phase motor (1 to 5 hp.). General purpose motors are designed to give added protection to electrical parts, without adding to over-all height. All openings are shielded to bar entrance of chips or falling objects. Polyphase shielded-type are available in either solid-shaft or hollow-shaft construction, while single phase shielded-type motors are only in solid-shaft construction. Both shielded types are for normal-thrust or high-thrust applications. All openings in stator frame and end shields are protected against entrance of splashing liquids. These motors are suitable for outdoor operation except where extremes of moisture, dust or other harmful agents make the selection of fan-cooled motors more economical. All frame sizes have common mounting dimensions, making possible interchangeability of many horsepower and speed combinations, including single-phase ratings. General Electric Co., Schenectady, N. Y.

Fluorescent Lamp

A new fluorescent lamp designed for low temperature operation. It will start and operate satisfactorily at temperatures as low as 0°F., when used in conjunction with Mirastat No. 4. Because of limited number of applications, lamp is available only in 40 watt T-12 medium bipin base, 3500° white fluorescent lamp. Lamp carries the marking "LT". Hygrade Sylvania Corp., Salem, Mass.



WESTINGHOUSE WATTHOUR PROTECTOR

Watthour Meter Protector

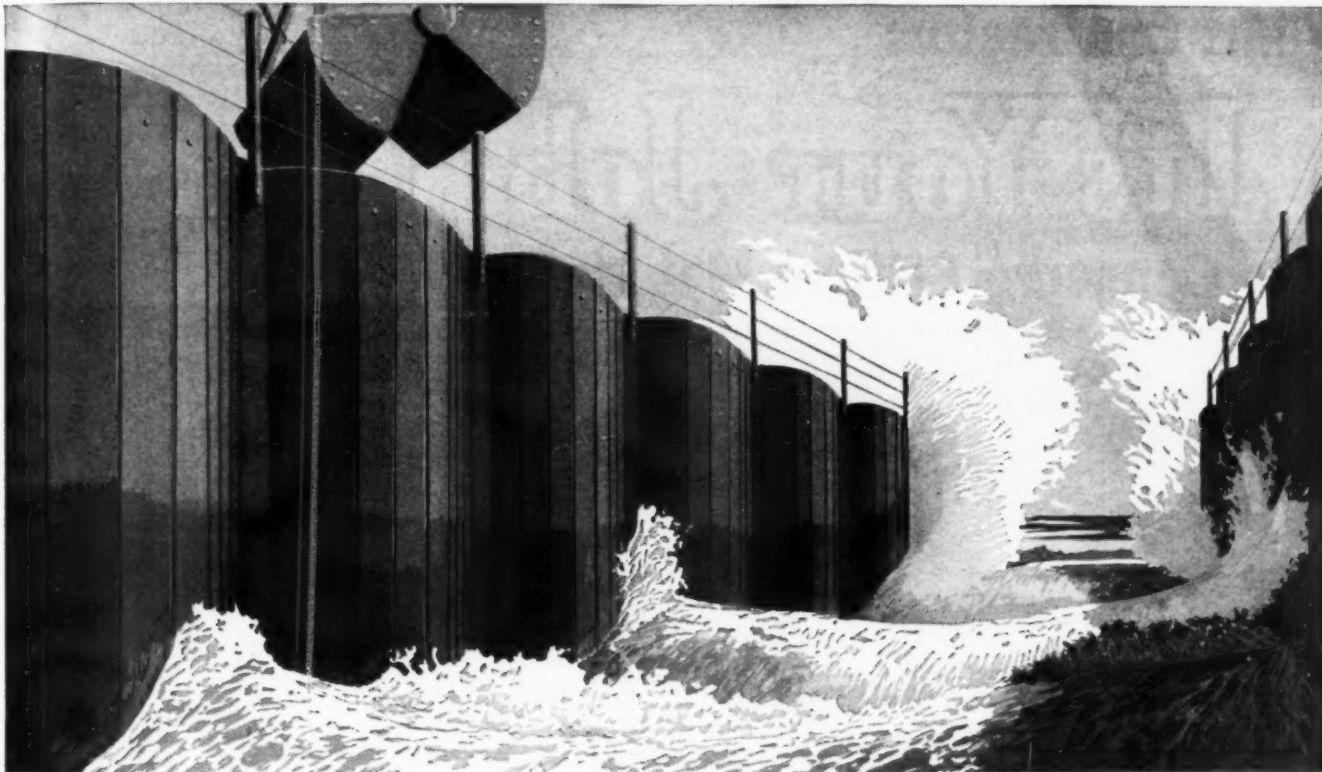
This new indoor watthour meter protector is for preventing damage due to lightning surge voltages. The unit, known as type A, has a line to ground rating cut off of 500 volts r.m.s., 60-cycle gap breakdown of 800 to 1200 volts r.m.s. and a discharge capacity of 20,000 amperes crest. Circuit voltage range is from 110 to 575 volts on 3-phase circuits. Protector consists of an assembly of porous block elements and series gaps. Is enclosed in round aluminum case filled with a non-inflammable compound. Design can be mounted by a conduit through one of the knockouts in connection box in which the watthour meters are mounted. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Floodlight

Permaflexor floodlights Nos. 0-500 and 0-1000 are all-purpose, utility, adjustable, open units for industrial use. May be used for a complete lighting system inside, outside and all around the plant. Open unit No. 0-500 accommodates either 500-watt or 300-watt incandescent mogul base lamp or a 400-watt AH-1, T-16 clear mogul base mercury lamp. No. 0-1000 uses either a 1000-watt or 750-watt incandescent lamp. Both units consist of steel housing, steel base and universal bracket supporting device which permits tilting and rotating unit. Pittsburgh Reflector Co., Oliver Bldg. Pittsburgh, Pa.



PERMAFLECTOR FLOODLIGHT



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in 24 Hours to Prevent Tie-up.

A new plant for making a chemical vital to airplane construction was mushrooming to completion in Texas. Came a day when lack of one electrical product threatened to tie up the job just short of the goal. Manufacturers' best delivery of the critical product was 60 days.

The local WESCO House not only had the particular product in stock but had ample quantities of the 15 different types required. In 24 hours the plant was supplied, work continued without interruption and 59 precious days were saved. Point of the story is this—the WESCO House *anticipated* the need for the item and was ready when the emergency call came.

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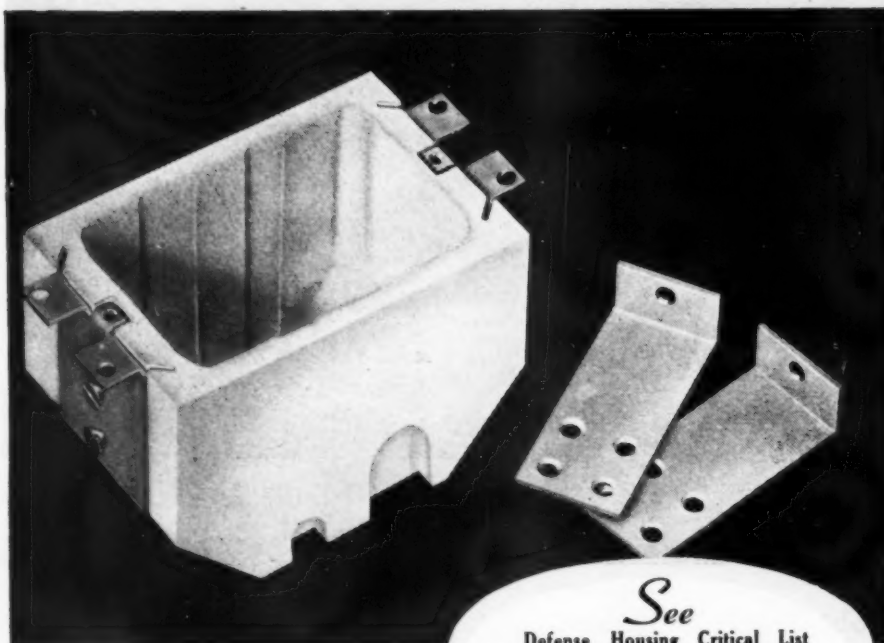
- * By warehousing thousands of items from hundreds of different manufacturers in hundreds of cities.
- * By supplementing manufacturers' advertising with own sales promotion efforts.
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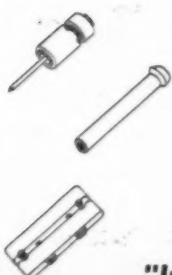
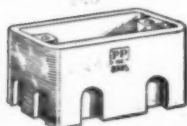
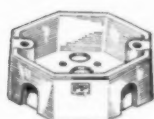


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The complacency of France, of Singapore—yes, and even our own Hawaii—must not be duplicated in our attitude toward the many little things of our everyday economy. The aggregate of many little things is the overall sum total of Material and Power which must mean Victory for our War Program.

"Install Porcelain Protected Wiring Systems in 1942."

PORCELAIN PRODUCTS, Inc.

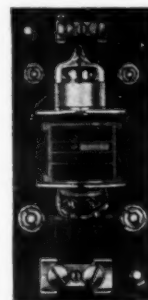
FINDLAY, OHIO



[FROM PAGE 98]

Mercury Plunger Relay

This silent mercury plunger relay has been redesigned and improved, to insure long life under severe conditions of vibration and shock. Some of the changes are—metal cap and support frame that held mercury tube were eliminated; mercury tube was made secure by single metal band; and area for terminal fastening and connecting was trippled. Relay has only one moving part. Unit is available for either a.c. or d.c. It is rated at 30 amperes, 110 volts, 1 hp. H-B Electric Company, 2530 N. Broad Street, Philadelphia, Pa.



HB MERCURY PLUNGER RELAY

Transformers

For operating 115-volt devices from 230, 460 or 575 volt power circuits, this line has extended its indoor air-cooled power circuit transformers to include capacities from 25 to 150 VA, incl. They are designed to provide 115 volts for operation of lighting circuits, individual lighting for machine tools, welding machines and other production machinery. Also for 115 volt electrical devices such as small motor-driven equipment, magnets, controls, relays. Transformers are self-contained, equipped with roomy wiring compartment for primary and secondary connections, insulated for safety. Jefferson Electric Company, Bellwood, Ill.



JEFFERSON POWER CIRCUIT TRANSFORMER

Electrical Contracting, April 1942

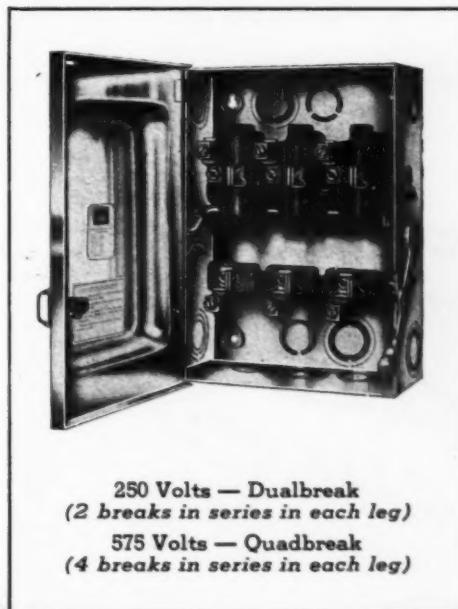
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HEAVY DUTY TYPE 'A'

COLT SAFETY SWITCHES



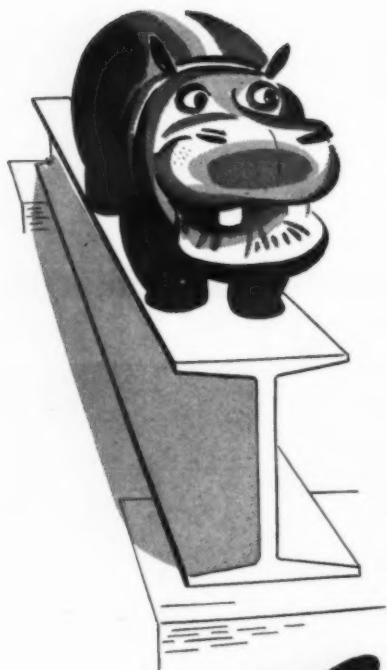
- ◇ Silver plated switch contacts and fuse clips.
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250 Volts — Dualbreak
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COLT'S PATENT FIRE ARMS MFG. COMPANY
ELECTRICAL DIVISION HARTFORD, CONN.



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WESTINGHOUSE
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FRAMES!

... JUST
ANOTHER POINT
WHERE THEY'RE
YEARS
AHEAD!

J-21233



See Page 2
and Page 3

EQUIPMENT *News*

[FROM PAGE 90]

Starter

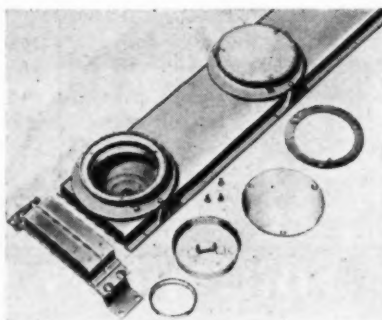
This "No-Blink" starter, FS-4 NA, is designed for use with 40-watt, 48-inch lamps only. It detects a faulty lamp immediately and after several attempts, if lamp does not light properly, starting switch is cut out of circuit automatically and remains out until faulty lamp is replaced with good one. Annoyance caused by blinking lamps is eliminated, and undue wear and strain on starting switch and ballast is prevented. Lloyd Products Company, Edgewood Station, Providence, R. I.



LLOYD
STARTER

Wiring Devices

A complete line of electrical fittings and accessories for underfloor distribution systems used with Q-floors, which are cellular steel, has been developed. It consists of distribution fittings, outlet fittings and accessories. Distribution fittings are called "header-ducts", which serve as feeders to bring wires to individual cells of Q-floor. Three types are available, (1) standard header-ducts for installation on top of cells; (2) slot header-ducts for installation in cells and top section of cells; (3) ceiling header-ducts for installation on cells. Fittings include high and low tension outlets. High tension outlet accommodates any standard twin convenience outlet. Outlets are installed on cells of Q-floor by means of fittings called "taps", which screw into upper portion of floor cells. Accessories are available to connect panel to Q-floor, connect conduit and for finished floors. General Electric Co., Bridgeport, Conn.

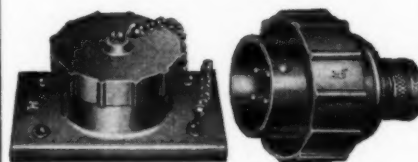


G-E HEADER DUCT

VAPOR-TIGHT PYLETS



FS-FD Pylet with vapor-tight
tumbler switch cover



Vaportight plugs and receptacles
1 to 8 poles, 20 amp. maximum



Hooks and loops for
lighting fixtures



Vaportight
lighting fixtures

Dependable wiring and lighting in the presence of dirt, gases, and moisture, requires the substantial protection built into Pyle-National vaportight Pylets. Weathertight sealing and heavy duty construction throughout provides for the most severe operating conditions of industrial service.

The complete range of vaportight fixtures includes conduit and wall bracket mountings, universal 4- and 5-hub types, two and three gang, handrail type, and outlet box fixtures for 10 watt to 200 watt lamps. Also midget vaportight fixtures for 10 watt lamps. Also vaportight plugs and receptacles, switches, circuit breaker Pylets, junction boxes, and cord grips.

Write for Pylet catalog 1100 with listings of all types and complete information on Pylet fittings.

The Pyle-National Company
1344 North Kostner Avenue
Chicago, Illinois

A Great New Advance in Fluorescent Lighting



INTO every fluorescent lamp, just before completion, goes a little blob of mercury. Not too little, because the lamp needs a minimum amount to operate efficiently; not too much, because then, in time, the excess deposits itself on the surface in the form of dark streaks and splotches.

To make sure the quantity is accurately measured, Hygrade engineers have produced the "mercury bomb"—a tiny metal container of mercury, weighed to the thousandth of a gram. Heated to the bursting point before the lamp is sealed, the "bomb" explodes—releasing mercury vapor in the precise volume required for best results.

Thanks to this exclusive fluorescent development, Hygrade Lamps are unique in being virtually free of "mercury shadow"—they remain "bright to the last inch."

But the "mercury bomb" is only one of the reasons for the superiority of Hygrade Lamps.

They give more light—a greater output of lumens per watt.

They have a smoother coating texture—something you'll readily observe if you compare them with other lamps.

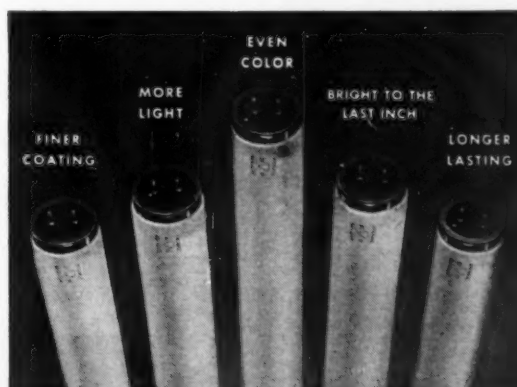
You can see, too, that they're more uniform in color—each lamp producing the same color of light.

And they last longer—a fact Hygrade users well know.

Good as these lamps are in any fixture they're even better when used in Hygrade "Miralume" fixtures—a complete "package" that's unit-engineered—lamps, fixtures and accessories made for each

other by Hygrade—with every part performing in harmony with the rest.

So when you recommend Hygrade Fluorescent Lighting, you're not only doing right by your client—you're building your own name as well. If you haven't yet received our free file-size kit—containing catalogs, prices and complete technical specifications on all Hygrade Fluorescent Lighting Equipment—write today to Dept. EC 4.



HYGRADE SYLVANIA CORPORATION
SALEM, MASS.

Makers of Hygrade Incandescent Lamps, Fluorescent Lamps, Fixtures, Starters, Sockets and Sylvania Radio Tubes



Compeco
R-F LUMINAIRES
ARE *Easily*
MAINTAINED

Bulbs and reflectors can be easily removed—free of wiring and encumbrances (all wiring on inside of housing).

Slots enable sockets to be removed quickly and practically. No pulling through holes or other inaccessible features.

Easy to hang at any desired angle.

In many cases the ability to utilize previous connections with the Compeco R-F makes wiring a simple job!

Compeco R-F LUMINAIRES are ruggedly built throughout. They are easy to maintain and give an outstanding quality of light 24 hours a day!

Dimensions for Double Lamp Units

IDEAL INDUSTRIAL LIGHTING
—for WAR NEEDS TODAY!
—for INDUSTRY TOMORROW!

Check these vital features:—

- NO LAMP STARTERS!
- NO MOVING PARTS!
- NO "STROB"!
- HIGHER LIGHT OUTPUT!
- MORE EFFICIENT LIGHTING!
- LOWEST INSTALLATION COST!
- NO DARK SHADOWS!
- COOL LIGHT!

WRITE TODAY for informative data!

COMMERCIAL METAL PRODUCTS CO.
2251 W. St. Paul Ave., Chicago, Ill.

COMPCO
CERTIFIED FLUORESCENT
COMPCO LINE OF QUALITY

COMPCO
FLUORESCENT LIGHTING

Smoke Alarm

Photoelectric smoke alarm type A25C indicates the degree of smoke density passing through the stack and signalling conditions of efficient combustion and excess smoke on green and red signal lights. The equipment includes photoelectric control, light source and indicator. The control and light source are mounted on opposite sides of the flue or stack. They are aligned so that the light beam projects to the eye of the photoelectric control. The control is wired to Densometer D4 which may be located at any point in the power plant for observation by the engineer. The meter gives a continuous indication of smoke density. Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass.



PHOTOSWITCH SMOKE ALARM

Fluorescent Lamps

Two new sizes added to this line of fluorescent lamps are the 6- and 8-watt lamps. They are designed for supplementary lighting purposes, such as instrument panels, counter lighting and over machinery. The 6-watt lamp is 9 inches long and the 8-watt is 12 inches long. Both are $\frac{1}{2}$ -inch in diameter. Single lamp ballasts have been used and the circuit for connecting them on 110-125 volts a.c. lines is the same as standard single-lamp circuit. Each requires a specially designed ballast, starter and lampholder. Available in 3500° white and daylight. Hygrade Sylvania Corp., 500 Fifth Avenue, New York, N. Y.

INDUSTRY ANSWERS THE CALL!

32,145 Firms With Over
17,700,000 Employees
Have Installed the . . .
PAY-ROLL SAVINGS PLAN



Have YOU Started the Pay-Roll Savings Plan in YOUR Company?

Like a strong, healthy wind, the Pay-Roll Savings Plan is sweeping America! Already more than 32,000 firms, large and small, have adopted the Plan, with a total of over seventeen million employees—and the number is swelling hourly.

But time is short! . . . More and more billions are needed, and needed fast, to help buy the guns, tanks, planes, and ships America's fighting forces must have. The best and quickest way to raise this money is by giving every American wage earner a chance to participate in the regular, systematic purchase of Defense Bonds. The Plan provides the one perfect means of sluicing a part of ALL America's income into the Defense Bond channel regularly every pay-day in an ever-rising flood.

Do your part by installing the Pay-Roll Savings Plan now. For truly, in this war, this people's war, VICTORY BEGINS AT THE PAY WINDOW.

MAKE EVERY PAY-DAY . . . BOND DAY!
U. S. Defense BONDS ★ STAMPS

This space is a contribution to NATIONAL DEFENSE by Electrical Contracting

Electrical Contracting, April 1942

WHAT THE PAY-ROLL SAVINGS PLAN DOES

1. It provides immediate cash use to produce the tanks, fighting ships, and planes needed to win. 2. It gives every American wage earner the opportunity for financial participation in National Defense. 3. By saving up regularly, you can avoid the current demand for money while they are scarce, thus will reduce the current demand for money. 4. It reduces the current demand for money by saving up regularly. 5. It builds a reserve for emergency financing in a critical period. 6. It builds a reserve for the purchase of new equipment. 7. It helps your company provide for their future.

A PAY-ROLL SAVINGS PLAN

The voluntary Pay-Roll Savings Plan (approved by Federal Reserve Board) provides for regular purchase by your employees of Defense Bonds through voluntary payroll deductions. All you do is hold out a small book containing the plan and all statements in a separate column of defense a Defense Bond to the employee.

To get full facts on installing the Pay-Roll Savings Plan, write TODAY to: Treasury Department, Section C, 709 Twelfth Street, NW., Washington, D. C.

U. S. Defense BONDS ★ STAMPS
This space contributed to National Defense by
YOUR NAME HERE

Plan Easy to Install

Like all efficient systems, the Pay-Roll Savings Plan is amazingly easy to install, whether your employees number three or ten thousand.

For full facts and samples of free literature, send the coupon below—today! Or write, Treasury Department, Section C, 709 Twelfth Street NW., Washington, D. C.

MAIL THIS COUPON NOW

Treasury Department, Section C
709-12th St., NW.
Washington, D. C.

We want to do our part. Please
rush full information regarding
the Pay-Roll Savings Plan.

NAME

POSITION

COMPANY NAME

ADDRESS

NUMBER OF EMPLOYEES



GPO 16-26944-1

Form No. DSS-280

GUARANTEED Against Cracking Due to Weather



Radiant
HARD GLASS
LAMPS



Why continue to expose your maintenance men to the hazard of replacing lamps cracked by moisture or sudden changes in temperature when Radiant Hard Glass Lamps give such dependable, economical service?

You'll get dependable, more economical outdoor illumination if you replace standard lamps with Radiant Hard Glass Lamps.

Ordinary lamps frequently crack while burning, when struck by rain, sleet or insects. Radiant Hard Glass Lamps, which have an extremely high safe operating temperature, are guaranteed not to crack due to climatic conditions. Less frequent replacements mean lower upkeep cost and less danger to maintenance men.

Radiant Hard Glass Lamps range from 500 to 2500 watts, and Radiant Standard Lamps from 750 to 1500 watts. Fit all types of industrial fixtures with mogul sockets. Radiant also makes a special 500 watt hard glass lamp similar in size to a 200 watt standard lamp, with medium or mogul screw base.

Leading concerns enjoy high quality performance, outdoors and indoors, with Radiant Lamps. Write for literature, prices and full information.

Radiant
LAMP CORPORATION
260 Sherman Avenue, Newark, N. J.
Manufacturers of Concentrated Filament Type Precision Lamps
from 50 to 10,000 Watts for the following types of service

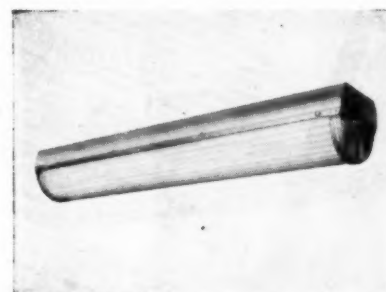
PROJECTION • SPOTLIGHT • FLOODLIGHT • AERONAUTICAL
MOTION PICTURE PRODUCTION • SOUND REPRODUCTION
SPORTS LIGHTING & GENERAL SERVICE

EQUIPMENT *News*

[FROM PAGE 94]

Fluorescent Unit

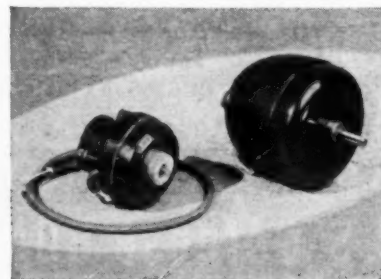
This fluorescent luminaire is designed for semi-direct or direct lighting for stores, offices and other commercial applications. Three types are available: (1) continuous row ceiling or surface mounted; (2) individual ceiling or surface mounted; (3) suspension mounted units. Fixture body is shaped with decorative ends. A semi-cylindrical section of fluted Alva glass, supported by hinged frame, diffuses the light. Lamp starter is enclosed in metal container with bayonet contacts and is equipped with condenser. It has a two-lamp ballast with internal compensators. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE FLUORESCENT UNIT

Fan Motors

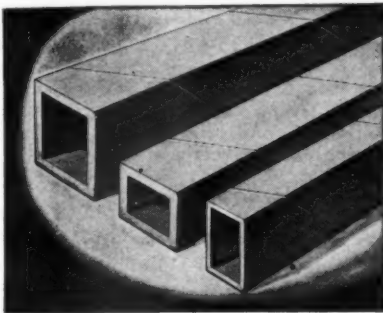
A new line of unit-bearing, shaded-pole fan motors for applications requiring short, quiet, compact motor has been announced. Suitable for use with commercial refrigeration, air conditioning and ventilating systems. Motors are available in three models for 115-volt, 60 cycle operation. Frame 51AL operates with or without air over motor at 1.5 watts, 1550 rpm. and with air over motor at 3 watts, 1400 rpm. Frame 51EL requires air over motor at 9 watts, 1550 rpm. and operates with or without air over motor at 3.5 to 6 watts at 1550 rpm. Frame 71GL is rated 1/40 and 1/25 hp., 1550 rpm., air over motor and is for use with direct-connected propeller fans only. A large oil reservoir provides for many years of operation without reoiling. General Electric Co., Schenectady, N. Y.



G-E FAN MOTOR

Tubes

Another improvement in tubes for electric coils has been announced. Heavy compression insuring a new degree of strength and resistance to collapse, finer accuracy in sizing to specifications, superior dielectric properties, lower moisture absorption rate, space-saving on "light jobs", square corners and straight side walls are among the advantages claimed for tubes treated by this added process. The improved tubes are preliminarily formed as before of dielectric kraft, or fish paper, or a combination of both. The paper is spirally wound on a steel die in an automatic machine. Tubes can be supplied in round, oval, square or rectangular cross section and in continuous lengths of any wall thickness with any inside or outside diameter. Precision Paper Tube Co., 2033 W. Charleston St., Chicago, Ill.



PRECISION TUBES

Photoelectric Blackout Sentinel

This newly designed photoelectric blackout sentinel automatically turns off advertising or store window lights when street lights go out. The equipment consists of a small box containing a phototube or electric eye and relays. It is installed in a second-floor window and directed on a street light outside the building. When the street lights go out during a blackout, a neon advertising sign on roof of building is automatically extinguished. When street lights come on, the sign is automatically relighted. The device has been developed especially for extinguishing unattended lights during air raid blackouts. General Electric Co., Schenectady, N. Y.



G-E BLACKOUT SENTINEL

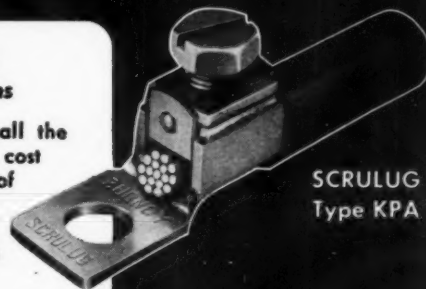
**HIGHER INSTALLATION COSTS
DEMAND GREATER PRODUCTIVITY —
GET MORE CONNECTIONS PER HOUR**

WITH BURNDY LUGS

SCRULUG, Type KPA

Low Cost Indoor Installations

Screw driver, pliers or wrench install the Scrulug, in matter of seconds. Low cost — high conductivity. Takes range of cable sizes. Try the Scrulug where space is limited — on panel boards and terminal blocks, in fuse boxes and safety switches.

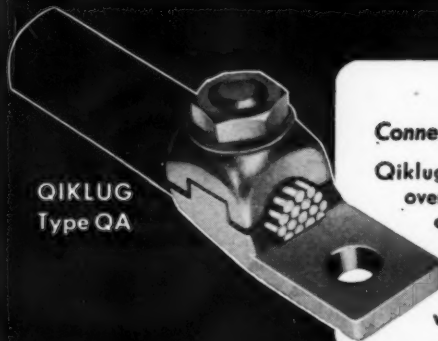


SCRULUG
Type KPA

QIKLUG, Type QA

Connections with the Turn of a Wrench

Qiklug connections stay tight, despite overloads, large temperature variations, and high mechanical stresses. The connector is made of high strength alloys, with good conductivity and corrosion resistance. Can be salvaged and used over and over again.



QIKLUG
Type QA

VERSI-LUG, Type EA

Speed Plus Versatility

A new idea in electrical connectors. The swivel design permits rapid connection of the conductor at any of five different angles — with a range of cable sizes. High mechanical strength, high conductivity and corrosion resistance. Quickly installed with an ordinary wrench.



VERSI-LUG
Type EA

See Your Wholesaler About Burndy Connectors

BURNDY ENGINEERING CO., Inc.
459 EAST 133rd STREET • NEW YORK, N. Y.



Keep Up-to-Date on new developments

through this **FREE SERVICE**

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation.

SERVICE EQUIPMENT

1 Bulletin No. 63 illustrates and describes type a.c. circuit breaker service equipment and load centers, also fuse type service equipment, FBX enclosed cutouts and panelboards. Frank Adam Electric Co.

FLOODLIGHTS

2 Catalog 2100 features floodlighting projectors of many types. It gives description, illustration, dimensions and specifications. The Pyle-National Company.

GENERATORS

3 A folder outlining revolving field generators for continuous duty isolated plants or to supplement other available power supply. Century Electric Co.

FLUORESCENT LIGHTING

4 A 24 page booklet illustrating and describing the Linolite commercial and industrial fluorescent lighting units. The Frink Corp.

TRANSFORMERS

5 Bulletin 411-CT describing and illustrating the Jefferson line of control, indoor type power circuit, door bell, chime and signalling transformers. Electrical and dimensional data is included. Jefferson Electric Co.

MOTORS

6 Bulletin MU-183, consisting of 34 pages, illustrates and describes single-phase, direct-current and small polyphase motors. Wagner Electric Corp.

ARC WELDER

7 A folder on Strikeasy arc welder especially developed for rapid fabrication of aircraft tubing and all thin-gage metals. General Electric Co.

INSTRUMENT

8 A folder illustrating and describing the Max-I-Meter, Max-I-Tran and Lincoln graphic demand meter to regularly check maximum demands on electrical equipment. H D Electric Co.

FLUORESCENT LIGHTING

9 A new 35-page booklet entitled "Facts, Questions, Answers on Fluorescent Lighting in Industry". It covers lamps and accessories, lamp equipment and lighting installations. Westinghouse Electric & Mfg. Co.

SURFACE WIRING SYSTEMS

10 Catalog No. 101 illustrating and describing sectional plastic surface wiring systems for factories, stores, offices, homes. Pierce Laboratory, Inc.

CONTROL

11 Bulletin GEA-3728 features the new G-E capacitor discharge control for use with stored-energy-method resistance welding. General Electric Co.

CELLULAR FLOORS

12 A catalog profusely illustrated with installation and working pictures on Q-floors. Detailed methods of installing electrical devices are described. H. H. Robertson Company.

ROTARY SWITCHES

13 Catalog No. 7140 features rotary type instrument, control, transfer and auxiliary switches. Diagrams of connections and switch developments are shown. Roller-Smith Co.

FLUORESCENT LIGHTING

14 Catalog No. 114, outlines the complete line of fluorescent fixtures for industrial and commercial lightings. Illustrations, descriptions and distribution curves are given on each unit. Day-Brite Lighting, Inc.

FITTINGS AND DEVICES

15 New 1942 catalog featuring all types of electrical conductor fittings and devices and a complete range of sizes in all the types. Penn-Union Electric Corp.

MAGNET WIRES

16 A four page folder illustrating and describing the new Roevar
[Continued on Page 100]

Circle numbers, sign and paste on your letterhead and mail in an envelope.

ELECTRICAL CONTRACTING

330 West 42d St.

New York, N. Y.

April

(Not good after June 1)

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
31

NAME TITLE

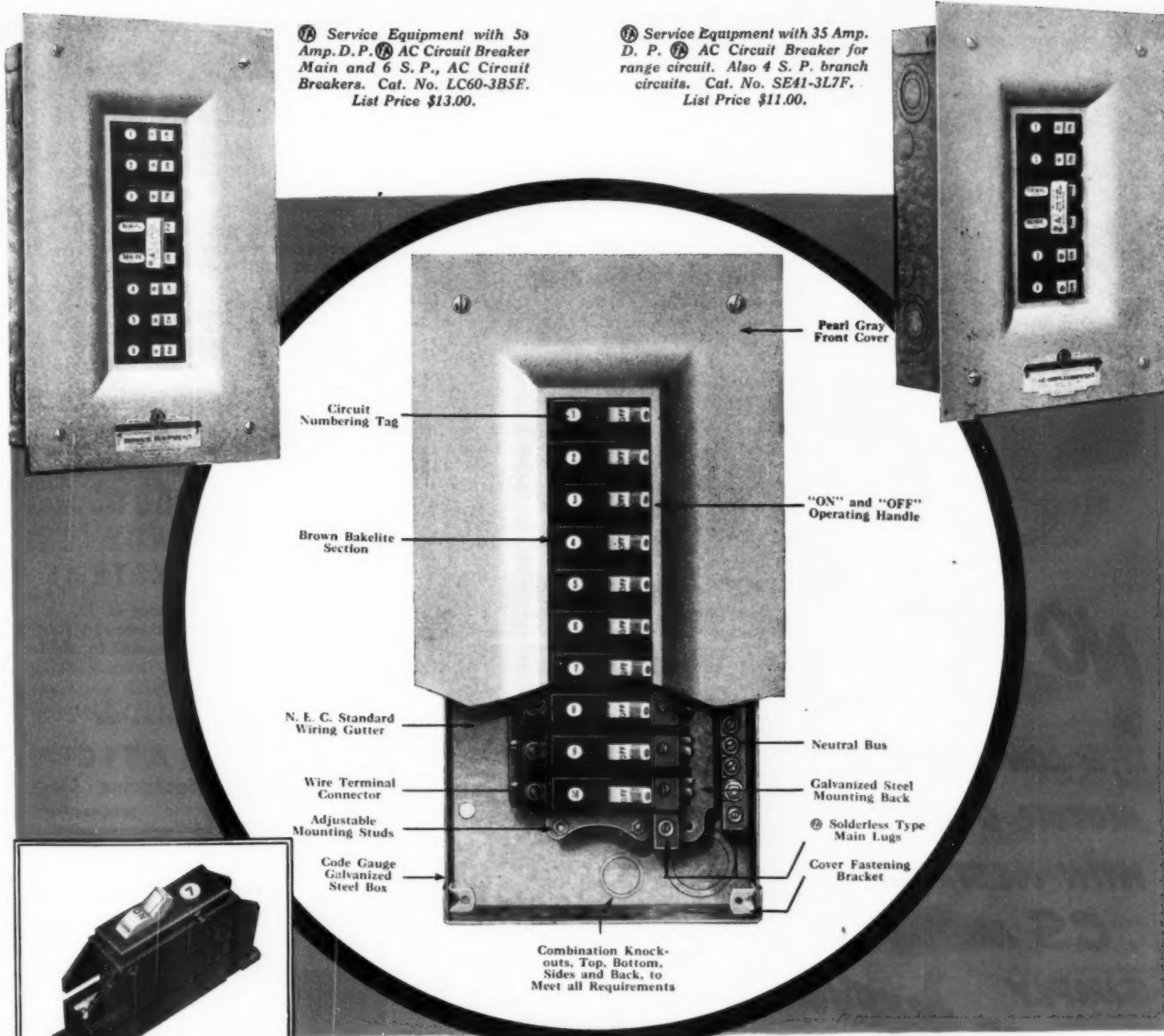
COMPANY

ADDRESS

CITY STATE

⑦ Service Equipment with 50 Amp. D. P. ⑧ AC Circuit Breaker Main and 6 S. P., AC Circuit Breakers. Cat. No. LC60-3B5F. List Price \$13.00.

⑦ Service Equipment with 35 Amp. D. P. ⑧ AC Circuit Breaker for range circuit. Also 4 S. P. branch circuits. Cat. No. SE41-3L7F. List Price \$11.00.



The heart of this equipment is the ⑧ Type AC Circuit Breaker—a single pole breaker of unique design, assembly and method of enclosure. Each breaker is fully enclosed in moulded bakelite. Good for long and satisfactory service.

Write for Bulletin 63

Sixteen pages of illustrations, dimensions and prices, together with suggested specifications (same Bulletin includes Fuse Type Service Equipment and Enclosed Cutouts)... Frank Adam Electric Company, St. Louis, Mo.

Defense Housing has priority

Defense housing will require a lot of residential building equipment. It will be needed in a hurry—quick delivery will count. And quick delivery you will get when you specify

⑧ Type AC Circuit Breaker SERVICE EQUIPMENT and LOAD CENTERS

Their exceptionally neat appearance appeals to Architects—and Contractors like the easy wiring and connection features. Owners appreciate the modern protection against overload—and the fact that there are only two handle positions — ON and OFF.

The rust-proofed cover is finished in attractive pearl gray lacquer... Solderless lugs of improved type, ample knockouts and plenty of wiring space in the one-piece steel box, make for easy installation... For alternating current—single phase two wire, single phase three wire, or three phase four wire, solid neutral feeder systems... Capacities: 15 to 50 amperes, for 120 volt AC service. Circuit breakers are unit pole construction. Approved by Underwriters' Laboratories.





NO MAGIC
—ABOUT
THE LONG LIFE THAT
MOTOR USERS GET
WITH WESTINGHOUSE
CS MOTORS —
SIMPLY
SEALED SLEEVE
BEARINGS.
...JUST ANOTHER REASON
WHY WESTINGHOUSE
MOTORS ARE
YEARS
AHEAD!



SEE PAGE 2
AND PAGE 3

New Literature

[FROM PAGE 98]

magnet wire. It also gives a table on diameters of bare and insulated wires. John A. Roebling's Sons Co.

CRANE CONTROL

17 A four-page leaflet, B-3020, describes crane controls for hoist motors up to 330 hp. for materials handling. Westinghouse Elec. & Mfg. Co.

FANS

18 A new catalog featuring desk fans from the 16-in. heavy duty oscillating type to the 10-in. oscillating type. Victor Electric Products Co.

TRANSMISSIONS

19 This transmission catalog-handbook includes 52 pages of recommendations, application data, photos and engineering information. Ideal Commutator Dresser Co.

ELECTRIC PRODUCTS

20 Catalog No. 421 illustrates and describes safety switches, service equipment, lighting panels, circuit master, Kbl-duct, and switchboards. Bull Dog Electric Products Co.

RECORDER

21 Folder GEA-3187C describes Type CF portable inkless strip-chart recorders for survey work, indoor or outdoor service. General Electric Co.

HEATER

22 Bulletin No. 64 illustrates and describes the electric Quikheater, built-in and portable types. Frank Adam Electric Co.

WIRE

23 Bulletin No. 201 gives mechanical and electrical specifications of Packard electric wire to specification AN-J-C-48 and 95-27074. Precision Tube Company.

HEATING UNITS AND CONTROLS

24 Electric heating units and controls for industrial application involving the heating of liquids, solids or air are described in this revised 38-page catalog. Westinghouse Electric & Mfg. Co.

FLUORESCENT FIXTURES

25 Catalog 10 illustrates and describes industrial and commercial fluorescent lighting fixtures. Sparkle Fluorescent Corp.

SAFETY SWITCH

26 Bulletin No. 415 illustrates and describes the new Vacu-Break

BLACK-OUT RELAYS

Relays to black-out signs, bulletins, window lights, or open any other electrical circuit automatically. On a momentary or accidental interruption in the power line the relay opens a circuit and remains locked in the open position until reset manually.

AIR-RAID SIREN CONTROLS

Timing devices for the operation of sirens or signals to sound "Alert," "Air-Raid" or "All-Clear" signals. Designed to meet any specification or schedule of coded signals desired.

BLACK-OUT EMERGENCY LIGHTING SYSTEMS

Provide automatic lighting of DC or blackout bulbs from a source of 6, 12, or 32 volts DC on intentional or accidental interruption of normal AC power lines.

Write for Information

AUTOMATIC
Electric Manufacturing Co.
Mankato • Minnesota

If It's Boxes or Fittings
You'll Find Them in the New

1942

AUSTIN

CATALOG No. CF17

144 pages of useful information. Full of valuable data and hundreds of illustrations to help you plan, lay-out and estimate every type of wiring installation.

SOME OF THE MANY ITEMS LISTED IN CATALOG No. CF-17

Outlet Boxes
Switch Boxes
Bar Hangers
Line-O-Lets
Box Connectors
Heavy Wall Conduit Fittings
Thin Wall Conduit Fittings
Bushings and Locknuts
Conduit and Cable Straps
R E A Fittings
Tools
Lugs
Nipples
Wires and Cables
Armored Cable
Thin Wall Conduit
Heavy Wall Conduit

SEND FOR
YOUR FREE
COPY TO-DAY

The M. B. Austin Company

110 S. Desplaines St.

Chicago, Ill.

Electrical Contracting, April 1942

safety switch with "Clampmatic" contacts and front operated rocker handles. Bull Dog Electric Products Co.

RESISTORS

27 Catalog 18, consisting of 16 pages, lists stock items in rheostats, resistors, tap switches, chokes and attenuators. Ohmite Manufacturing Co.

TOOLS

28 A new 28-page catalog covering complete line of portable pipe and bolt cutting and threading machines; power drives and power units; pipe cutting and threading tools; pipe reamers; vises. Beaver Pipe Tools, Inc.

LIGHTING FIXTURES

29 Catalog No. 40 illustrates and describes the complete line of luminaires for fluorescent and incandescent lamps for industrial and commercial lighting. Edwin F. Guth Co.

CABLE

30 Folder GEA-2623A features No. 1799 varnished cambric cable. It tells how it's made; advantages; uses; operating data and representative types. General Electric Co.

INSTRUMENT

31 Bulletin 1710 describes the Jones heavy duty hand tachometer, an indicating instrument for measuring speed directly in revolutions per minute or feet per minute. James G. Biddle Co.



NO WORRIES over restricted building and priorities line the face of F. M. Carey of Carey Electric Shop, LaGrange, Ill. For the past number of years he has specialized in appliance repairs from "soup to nuts." Now he and his assistant Claude Heater (in background) are ready for the avalanche of repair business that restricted appliance sales will bring them.

SPEED WIRING

Of "War" Plants and Homes
USE IDEAL WIRING TOOLS AND EQUIPMENT



IDEAL
FISH TAPE REELS and PULLERS
3-Tools-in-One

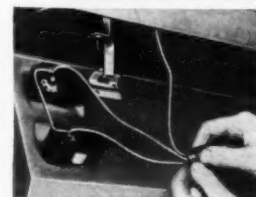
Combines fish tape, reel and puller, in one tool, for faster, better, easier conduit wiring. Saves half the time required for "fishing" in the old way, as tape is pulled through conduit and reeled in one operation. Saves time-wasting and costly tape-breakage. Prevents slipping; eliminates need for pliers and special pullers. Sizes and tape lengths to meet all requirements.



Solderless, Tapeless, Wire Connectors
STRIP WIRES SCREW ON THAT'S ALL

SAVE TIME—make a better, stronger, safer joint. No open flame hazard. Wires twist tightly insuring 100% contact, preventing shorts, grounds and corrosion. Sizes for small outlet boxes, as well as sizes large enough to join 3 No. 10 wires. **FULLY APPROVED**; Listed by Underwriters' Laboratories, Inc.

MILLIONS IN USE



CONSERVE CRITICAL MATERIALS

Save Vital Defense Materials: Lead, Tin and Rubber.

NO

Ideal for Fluorescent Wiring

For Wiring within fixtures, for hanging fixtures, roughing-in, installation, etc.

Solder, Friction or Rubber Tape, Flux, Blow Torch, Soldering Iron or Cups

Use Coupon Below for **FREE** Samples

IDEAL COMMUTATOR DRESSER COMPANY

1041 Park Avenue

Sycamore, Illinois

Sales Offices in All Principal Cities

Mail this
Coupon for
FREE
SAMPLES
"Wire-Nuts"

Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Illinois
Please send me **FREE** Samples of IDEAL "Wire-Nuts".

Name

Firm

Address

City..... State.....

Also send me detailed information on

IDEAL
WIRE AND CABLE REEL

Speeds wiring jobs; prevents snarls and knots in handling wire, cable, cord, etc. Hang one, two or more reels from pipe, joist or beam. Inexpensive.



IDEAL

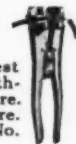
CABLE RIPPER



Rips non-metallic sheathed duplex or lead covered cables, quickly, cleanly, easily; or rips outer sheathing of other cords up to 1/2" diameter.

IDEAL

E-Z STRIPPER



Speedily strips the toughest insulation in one squeeze, without nicking or cutting wire. For solid or stranded wire. Four sizes strip No. 30 to No. 8 gauge.

IDEAL

JOIST BORING MACHINE



A big time-saver! Five times faster than brace or breast drill. Does away with dangerous reaching, climbing up and down ladders, or back breaking stooping. Bore below floor or up to 11 ft. above floor.

IDEAL

SOLD THROUGH JOBBERS

In the News

McGRAW AWARD TO EARL WHITEHORNE

On March 14 the James H. McGraw Award Medal for Cooperation for 1940 was presented posthumously to Earl Whitehorne. Acting for the Committee of Awards, Charles E. Swartzbaugh gave the medal to Mrs. Whitehorne at her home in Caldwell, N. J.

When the judges met in January 1941 to consider the candidates for the Medal for Cooperation for 1940, they selected Earl Whitehorne, editor of *Electrical Contracting* to receive this award. Mr. Whitehorne was at home convalescing from a serious illness at the time and he was notified of this honor bestowed upon him by his fellow workers. It was the intention of the judges to make the presentation at a ceremonial dinner in New York when he recovered. He did not return to his office and passed away on October 23. The judges reaffirmed their decision and voted that the medal and purse be given to his widow.

The judges who selected Mr. Whitehorne for this honor were E. A. Hawkins, Graybar Electric Co., New York; C. M. Munoz, Harry Alexander, Inc., New York; M. E.



POSTHUMOUS HONOR. C. E. Swartzbaugh presents the James H. McGraw Medal for Cooperation and the citation to Mrs. Whitehorne at her home in Caldwell, N. J.



EARL WHITEHORNE

Skinner, Buffalo, Niagara & Eastern Power Corp., Buffalo and Charles E. Swartzbaugh, The Swartzbaugh Manufacturing Co., Toledo.

The citation which accompanied the award read as follows:

"Earl Whitehorne, editor of *Electrical Contracting*, had in 34 years of electrical publishing come to occupy a unique place in the electrical industry. Holding important editorial posts on a number of electrical publications, he was equally well known to manufacturers, contractors, wholesalers, retail groups and utility men. He held the friendship, admiration and confidence of all because of his human warmth, his essential fairness, his understanding, his never failing desire to be helpful, his ability to get to the core and center of an industry problem and his keen sense of humor that kept himself and others in balance.

"His period of service covered the expansion of the electrical industry to the giant it is today. Many of his contemporaries and close friends were pioneers of this vast development. He early saw the promise of electrical growth and was among those who first realized that the tremendous potential could only be achieved by the harmonious working together of all the industry elements involved. The utilities, the manufacturers, contractors, wholesalers, engineers and retailers, all must play their part and be rewarded by a just return.

"And so he became one of the major advocates of cooperation. Unceasingly, year

after year, in print and in person, he presented the case for a united industry; for a greater comprehension on the part of each industry group of the problems of all the other groups and a willingness to work for common ends.

"He worked for higher service standards in equipment and more adequate wiring installations. He headed the 'Industry Conference on Wiring' in 1927 that showed up the fallacy of the controversy then raging over the cost of wiring. He gave much time, thought, and effort to the electrical league movement. He was president of the Electrical Association of New York when the Modernization of Industry program was launched. From the foundation of the James H. McGraw Award he was the representative of Mr. McGraw in the presentation of the awards.

"As for his relation to the men he worked with in this industry, no statement could be so fitting as the words he, himself, wrote of another recipient of this award: 'He brought a spiritual stimulus to men that widened their horizon, strengthened their courage, increased their tolerance and left them richer for having known him.'

"In recognition of his outstanding services to the advancement of cooperation in the electrical industry, the judges decided to disregard his affiliation with the Committee of Awards and with the McGraw-Hill organization, and voted to Earl Whitehorne the 1940 Medal for Cooperation and the purse given under the James H. McGraw Award.

"It is a matter for deep gratification that this decision was taken during his lifetime, and that he was notified of this honor done him by his fellow workers. Since his lamented death, the judges have reaffirmed the award, and present the medal and purse to Mrs. Whitehorne."

NECA ESTABLISHES RESEARCH DEPARTMENT

A research department has been established in the Washington office of NECA under the direction of the Washington manager, Paul M. Geary.

Wilford C. Fuller has been appointed as an assistant to Mr. Geary to carry on the activities of this department. It will be the purpose of this research department to compile information on all phases of the electrical contracting business and the capacity and facilities of the industry for handling Federal and other construction work in every part of the country.

Mr. Fuller has had a number of years experience in the construction industry and is well fitted to take up his activities in this research department.

WIRE TABLES OF '37 CODE ALLOWED

Through action of the Electrical Committee an interim amendment to the National Electrical Code permits the use of wire current carrying capacities based upon Table I of the 1937 Revision for the duration of the war.

Tentative Interim Amendment No. 41, pertaining to the change, was adopted by

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FRICTION AND RUBBER TAPES

letter ballot of the Committee on Feb. 26 and has been "recommended for application in the administration of the National Electrical Code."

The Amendment inserts a note to follow Section 3004 (page 85) of the 1940 edition of the National Electrical Code reading as follows:

"Note: For the duration of the defense emergency and to assist in the conservation of copper and rubber, conductors having Code grade rubber insulation that are not operated continuously with maximum currents may have the allowable current-carrying ratings that were given them in Table I of the 1937 edition of this Code and the limits of allowable current because of more than three conductors in a raceway (Note 5, page 303, 1940 text) and because of room temperature being over 30 C (Table I, page 301, 1940 text) need not be applied."

ARTICLE COMMITTEES REJECT BARE NEUTRAL

Acting at the request of the War Production Board for action on proposals for the approval of bare neutral wiring as a means of saving rubber, article subcommittees have recommended that the Electrical Committee approve slow burning or weatherproof covered wires for grounded neutral conductors on alternating current systems. This recommendation is intended to meet the needs of rubber conservation without general Code approval of bare neutral.

Article subcommittees also recommended that covered neutral cable (CNX) be accepted by the Code authorities as an approved wiring method for defense emergency building for the duration. These recommendations will be acted upon by letter ballot of the Electrical Committee.

A joint meeting of article subcommittees requested that no new revision of the Code be prepared for 1943, the next scheduled revision year, but that a supplement be issued to the 1940 Code to include only new rules and amendments pertaining to war time problems. It was also recommended that a small committee be set up empowered to publish rulings as war emergency recommendations effective only for the duration.

350,000 MORE DWELLINGS PLANNED

The construction of an additional 350,000 dwelling units for war industry workers has been approved by the War Production Board according to an announcement on March 17. This program, recommended by the National Housing Agency more than doubles the original defense housing program announced last September 19.

Of the newly approved dwellings, 150,000 will be erected by agencies of the Federal Government and the remaining 200,000 will be privately financed.

INDUSTRY MEETINGS HELD AT DENVER

A series of meetings arranged by the Rocky Mountain Electrical League and affecting every branch of the electrical industry was launched March 16 at Denver, Colorado.

Art Schanuel of the National Adequate Wiring Bureau headed a conference with the electrical contractor group on March 16. The following day he addressed an all-industry luncheon group on residential wiring under present and future war conditions.

The Rocky Mountain Chapter IAEI held its annual meeting on March 26-27 in Denver. Delegates from a dozen states were present to review numerous subjects of vital interest to the electrical fraternity. Jobber problems, possible changes in wire tables, motor installations, blackouts, defense lighting and code problems occupied the program roster of the two-day session opened jointly by George R. Hubbard, chairman of the Rocky Mountain Chapter, IAEI and T. M. Foulk, chairman of the Denver chapter of the League.

Following closely on the heels of the inspector meeting was a general session of the Electrical League on March 30. Dr. George W. Allison, National Better Light Better Sight Bureau, gave an inspiring

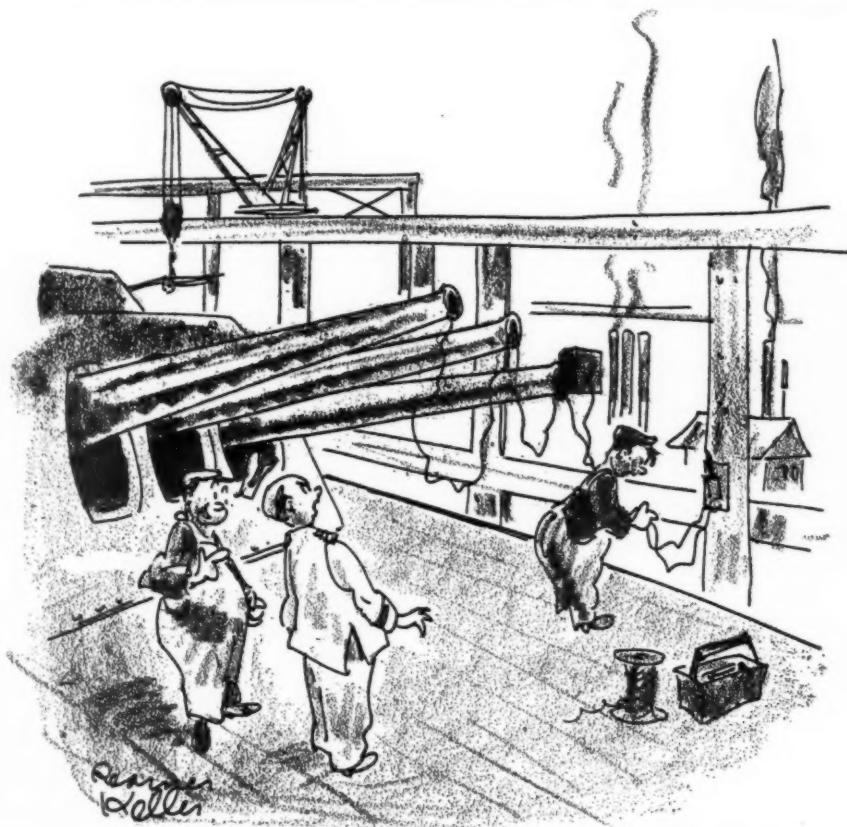
talk on "Bright Spots in the Picture." This was the first of several appearances of Dr. Allison in the Rocky Mountain League territory. He also spoke at Montrose, Grand Junction, Salt Lake City, Cheyenne and Greeley, carrying the message of defense lighting and covering other subjects of general interest to the electrical industry.

On April 9, the fast growing Rocky Mountain Chapter, I.E.S., heard Willard C. Brown, national president of the Society and one of the nation's leading authorities on lighting, discuss wartime developments in the field of illumination.

The series of meetings will be continued on April 16-18 when the Accounting and Engineering Divisions of the League will hold their annual spring meeting at the Shirley Savoy Hotel, Denver. Chairmen Harry Adler and O. P. Reed of the Accounting and Engineering Divisions respectively, will pilot these sessions.

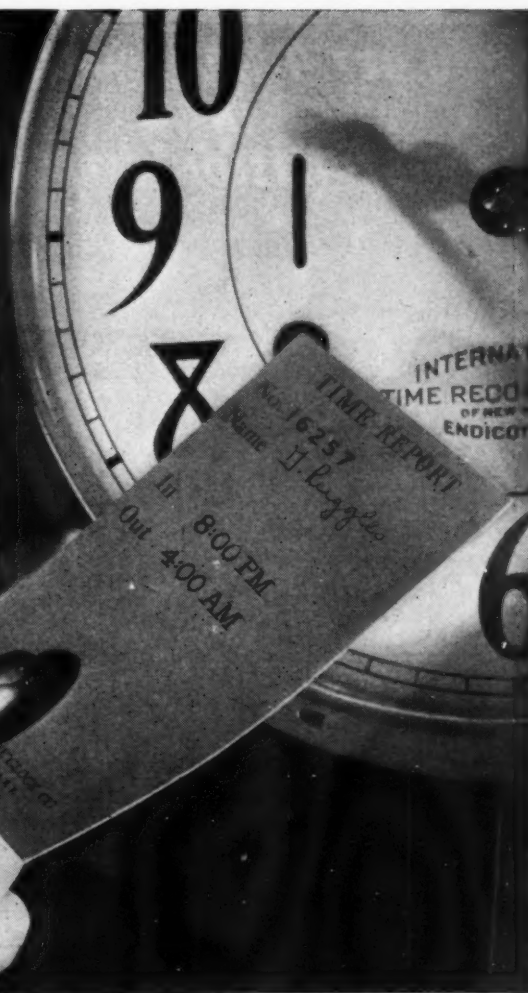
INSPECTORS URGED TO SPOT SABOTAGE

Electrical inspectors were admonished by a Federal Bureau of Investigation official to be constantly on their toes to spot work of the saboteur or spy. Stressing the value of being forewarned of possible lurking danger that would hamper the nation's war program, Special Agent A. C. Schlenker of the FBI's Buffalo office, addressing the Empire Chapter IAEI said such information gives authorities an opportunity to quickly track down potential enemies of the country.



"Lucky we have these spare conduits. Now you can shave on watch."

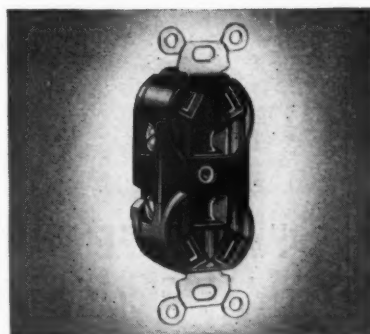
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24 HOUR DAYS
and
7 DAY WEEKS**



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SHALLOW HEAVY DUTY FLUSH SWITCH NO. 5861 is made to withstand the continuous use required in industrial service today. The mechanism is enclosed in rugged bakelite. The handle is made of a special unbreakable plastic. New type 20-ampere mechanism insures trouble-free service. U. L. "T" rated. Conforms to Federal Specifications.



THREE-WIRE DUPLEX OUTLET NO. 4327 for grounding portable equipment. Polarity is maintained when plug is inserted in either outlet. Double-sided contacts insure register.



COMPOSITION CORD GRIP LAMPHOLDER NO. FQ3770 is made of special tough composition and is resistant to heat and fumes. The cord grip protects the wire connections.

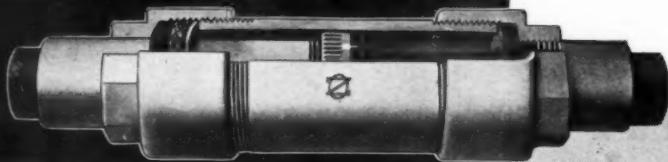
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WIRING DEVICE FOR EVERY NEED

YOU GET 4 "PLUS VALUES" IN O. Z. EXPANSION FITTINGS



"There's also an O. Z. End Type Expansion Fitting to permit expansion and contraction of conduit within a junction box."

Says the Wizard of O-Z



- 1 Inside ring of Copper-mesh maintains positive, continuous ground.
- 2 Bakelite bushings prevent cable abrasion.
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Write for Bulletin 105

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B-5 MEGOHMMER

Ranges: 0-200 Megohms
0-2000 Ohms
0-300 & 0-600 Volts DC

Steady test voltage of 500 volts DC instantly available, at the touch of a push button. Direct readings of insulation resistance obtained on special color-graded scale without any calculations.

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Here's the equipment for your Victory speed-up program—to handle ALL electrical work and refrigeration soldering. For example, Insto-gas Torch No. 1 makes a pencil flame ideal wherever a clean, constant, hot, pointed flame is required. Gets into tight spots. Does not burn insulation. All Insto-gas torches light instantly and won't blow out. Light-Weight Torches for all sizes of work.

Mail Coupon or Write TODAY

INSTO-GAS CORP., 1906 E. Jefferson, Detroit
Send complete information on torches and furnaces and name of nearest distributor.

Name.....
Address.....

In the News

[FROM PAGE 104]

"You men are better trained than most persons to detect attempts at sabotage," the FBI agent declared. "Anything that to you appears suspicious should be brought to our attention. We would rather you came to us with 1,000 complaints, no matter how seemingly unimportant, and let us evaluate them, than to let one significant thing go by."

Among those who addressed the quarterly sessions of the chapter were Victor H. Tousley of Chicago, field engineer, National Fire Protection Association; R. W. Mitchell, president, Electrical Association of the Niagara Frontier; H. P. Dendel, Lansing, Mich., chief engineer of the Michigan Millers Mutual Insurance Company, and Arthur L. Abbott, New York City, a representative of the National Electrical Manufacturers Association. Garrett S. Casterline of Syracuse was chairman.

CALIFORNIA ELECTRICAL ORGANIZATIONS MERGE

As a result of a carefully organized plan to weather the storm of the War period, the Northern California Electrical Bureau and the Electrical Appliance Society of Northern California were recently consolidated.

"Northern California Electrical Bureau" is the name adopted for the new organization. The Bureau has moved from 447 Sutter St., San Francisco, to the suite of offices in the Furniture Mart occupied by the Electrical Appliance Society and other organizations.

Operation of the new Bureau will be divided into four sections comprised of, Wiring; Educational; Lighting and Appliance Sections.



LABOR'S COOPERATION with the electrical contractor is typified by the hand clasp of E. J. Fransway (left) Milwaukee, president, Electrical Workers State Conference, Wisconsin and E. H. Herzberg, Milwaukee, Chairman, National Joint Committee on Apprenticeship Standards for the Electrical Construction Industry.



PRIORITY PROBLEMS and the plight of the small business man were discussed by William K. Evans, Regional OPM Analyst, Chicago, at the recent Illinois Chapter IAEI meeting.

EMERGENCY STANDARDS INSPECTOR TOPICS

The Minnesota Electrical Inspectors Association is fostering an educational program to enlighten inspectors and contractors on code problems, standards and emergency substitutions. To promote the program, the group has acquired the facilities of the Dunwoody Institute, leading Minneapolis industrial trade school, for bi-monthly meetings. According to Glenn Rowell, secretary-treasurer of the association, these will be all-day sessions covering current inspector-contractor problems.

This plan was approved at the annual meeting of the association, held in conjunction with the North Central Electrical Industries convention in Minneapolis, Feb. 22-25. Officers elected at this meeting were: president, Allen E. Wolf, Waseca, Minn.; vice-president, D. A. Hilger, Minneapolis; secretary-treasurer, Glenn Rowell, Minneapolis. Members of the association's Executive Committee are Albert Everling, New Ulm; George Garney, St. Paul and F. W. Trayser, Minneapolis.

FHA REQUESTS

COVERED NEUTRAL APPROVAL

The electrical section of the Defense Housing Critical List which became effective February 24 was referred to the Electrical Committee by FHA with a request that the National Electrical Code permit the use of the materials listed.

In transmitting the request, H. P. Vermilya, Director of the Technical Division FHA said, "in view of the fact that the rubber situation has become intensely critical consideration should be given to the possibility of revision to the limitations under which single conductors of the slow burning weatherproof type may be used."

"In view of the fact that all public and private housing for defense purposes will be limited in the materials they may secure to those permitted by the Critical List, it is essential particularly with regard to private construction, that the National



GENERAL ELECTRIC

QUALITY WIRING DEVICES Meet Every Need

For Factories . . Defense Housing . . Cantonments

Wiring devices for every type of building . . . permanent or temporary . . . are included in the G-E line. These devices are easy to install and will give trouble-free service. Their quality is high. Included in the line are heavy-duty and standard switches . . . convenience outlets and heavy-duty polarized outlets . . . devices for surface mounting . . . sockets and caps . . . fuses, small circuit breakers, etc.

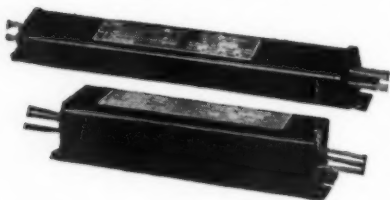
G-E wiring devices are handled right in your own territory. G-E Distributors are located at all key points in the country.

For further information on wiring devices suited to your needs, see the nearest G-E Merchandise Distributor or write for a G-E Wiring Device Catalog. Address Section D-284, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL  ELECTRIC

Get ALL the PERFORMANCE to which FLUORESCENT LIGHTING ENTITLES YOU

Contractors should be particularly interested in this important message. When entrusted with the selection and buying of material and installation of a fluorescent lighting system, the contractor assumes considerable responsibility. Future business depends upon satisfied customers.



There's a big difference in fluorescent lighting results, largely depending on the accessories used in the installation. That's why it's so important to specify and standardize on Acme Fluorescent Lamp Ballasts. Acme helped pioneer this new and modern form of lighting by designing ballasts that exactly meet the electrical characteristics of the lamp. For example; Acme dual or two lamp ballasts have balanced secondary—(providing exactly the same voltage to each lamp.) This assures longer lamp life, greater brilliancy and high operating efficiency and performance. All Acme ballasts are noise-insulated to minimize normal magnetic action of core and coil elements.



Write for Acme Bulletin 153 which provides specifications covering 68 styles and types of Fluorescent Ballasts.

What Do You Know About AIR-COOLED TRANSFORMERS

More popular every day, where SPEED, PERFORMANCE, SAFETY and ECONOMY are concerned, Acme Air-Cooled Transformers make a Power Wiring System do two jobs, connected to the power line, lighting circuits can be tapped off wherever required. No need for separate lighting system. And in plants where the addition of power equipment is dangerously overtaxing wiring system, main line voltage may be increased thus automatically increasing the wiring capacity, and by using Acme Air-Cooled Transformers at branch circuits or at machines, motors will not require rewinding. Write for the Acme Air-Cooled Transformer bulletin.



THE ACME ELECTRIC & MFG. CO.
36 WATER ST. CUBA, N. Y.

Acme **ACME** Electric
TRANSFORMERS

In the News

[FROM PAGE 107]

Electrical Code permit the uses of those materials which are allowable under the Critical List. You are no doubt aware of the fact that many local building authorities have adopted the National Electrical Code by reference.

"It is extremely important in this emergency that private building be permitted to practice conservation insofar as it can with safety. For this reason we would appreciate very much early consideration by your Committees of changes in the National Electrical Code which would make possible continuation of private building with the use of the least practical amount of critical materials."

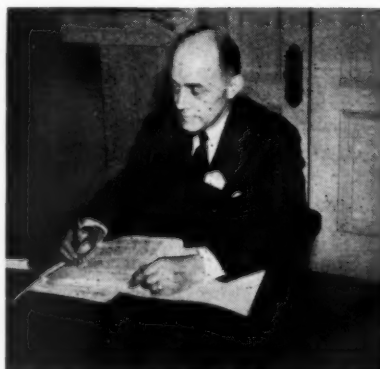
The new Defense Housing Critical List which follows, specifies the types of wiring materials and the extent to which they may be used on housing under a preference rating order.

General:

Outlets

The number of outlets allowed for fixtures, snap switches convenience and special purpose receptacles for each dwelling unit shall not exceed the sum total calculated as follows:

- a. Bathroom—Two outlets.
- b. Kitchen—Four outlets.
- c. Dining Room or Dining Space—Three outlets.
- d. Living Room—Four outlets.
- e. Each Other Habitable Room—Four outlets.
- f. Each Private Hall—Two outlets.
- g. Each Private Foyer—Two outlets.
- h. Each Exterior Entrance—One outlet.
- i. Utility Room—Three outlets.
- j. Basement (1) in dwellings which do not contain a utility room—Five outlets. (2) In dwellings which contain a utility room in addition to a basement—three outlets.
- k. Garage—one car, two outlets; two car, three outlets; multi-family: Two outlets for each enclosed car stall.
- l. Other Areas, including public stair-halls, service spaces, etc.—Number as de-



LIGHTNING PROTECTION systems for Uncle Sam's ordnance plants are being installed under the watchful eye of W. T. Alcock, lightning protection specialist of Underwriters Laboratories, Inc., Chicago. He is serving the government in an advisory capacity.

Why dig through a PILE of Catalogs?



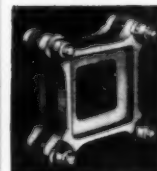
Find the Fitting you need—
quickly—in the **COMPLETE** line

If you have a Penn-Union Catalog, you can instantly find practically every good type of conductor fitting. These few can only suggest the variety:



Universal Clamps to take a large range of conductor sizes; with 1, 2, 3, 4 or more bolts.

L-M Elbows, with compression units giving a dependable grip on both conductors. Also Straight Connectors and Tees with same contact units.



Bus Bar Clamps for installation without drilling bus. Single and multiple. Also bus supports — various types.



Clamp Type Straight Connectors and Reducers, Elbows, Tees, Terminals, Stud Connectors, etc.



Jack-Knife connectors for simple and easy disconnection of motor leads, etc. Spring action — self locking.

Vi-Tite Terminals for quick installation and easy taping. Also sleeve type terminals, screw type, shrink fit, etc. etc.



Splicing Sleeves, Figure 8 and Oval, seamless tubing—also split tinned sleeves. High conductivity copper; close dimensions.

Preferred by utilities, industrials, electrical manufacturers, contractors — because they have found that "Penn-Union" on a fitting is their best guarantee of Dependability.

**PENN-UNION
ELECTRIC CORPORATION**
ERIE, PA. Sold by Leading Jobbers

PENN-UNION
Conductor Fittings



THIRD TERM as president of the Wisconsin Electrical Association was the honor recently accorded Robert J. Nickles, Madison, Wisconsin. Bob graciously declined but was over-riden by a unanimous vote.

terminated for the individual case by the office processing the application.

m. Special Purpose Outlets for ranges, refrigerators and for heating, ventilating, and plumbing appliances and equipment—Number as determined for the individual case by the office processing the application. (Where house is piped for gas range outlet is not eligible.)

The following items each count as one outlet provided the wiring device (or devices) is installed in one outlet box: single snap switch—combination snap switch and convenience outlet—duplex convenience outlet—fixture outlet—combination fixture and convenience outlet—special purpose outlet.

Service Entrance

- 321 Non-metallic service cables.
- 322 Moisture resistant cables only for underground installation in non-metallic service raceways.
- 323 Service cable head.
- 324 Service equipment, panelboards and enclosures—non-metallic or ferrous sheet metal enclosures; Non-metallic coated sheet metal; zinc coated sheet metal for exterior use or where imbedded in exterior concrete or masonry. Copper or copper alloy for current-carrying parts only. Over-current devices may be fuse or automatic type, thermal or magnetic.

Interior Wiring

- 331 Covered neutral cable.
- 332 Insulated single conductors.
- 333 Non-metallic sheathed cable.
- 334 Non-metallic service cable—for range and domestic water heater circuits and for feeders from a master service cabinet to supply other structures.
- 335 Armored cable—Federal Specification E-J-C-71 type—only for:
 - 3351 Embedding in plaster.
 - 3352 Chases or hollow spaces in masonry or concrete.
 - 3353 Motor connections from motor outlet to motor terminal.
 - 3354 Fishing in existing concealed spaces.
- 336 Flexible metal conduit—zinc coated ferrous metal—only for flexible connections to motor terminals as an extension of 337 or 338 following.



TIME-SAVING FEATURES OF J-M TRANSITE DUCTS -- NO. 1



Harrington Couplings are installed cold... need no special skill to form tight joints... assure correct alignment. A complete line of bends, sweeps and special fittings is available.

There's no lost motion assembling Transite Ducts. Harrington Couplings eliminate screwing or threading... go together quickly... drive up tight.

Transite's smooth, slick bore means rapid cable pulls. Because Transite Ducts are light in weight, they are easily handled. And on the job, their asbestos-cement composition assures complete fire-safety, unusual resistance to corrosion.

For details, write for brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N. Y.



ON EXPOSED LOCATIONS, Transite Ducts assure permanently low maintenance. Their asbestos-cement composition is unusually resistant to weather, smoke and fumes.



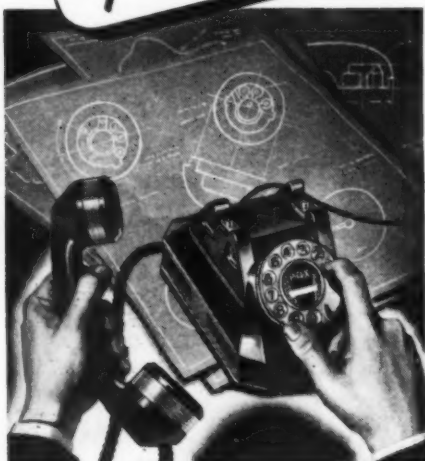
Johns-Manville

TRANSITE DUCTS

TRANSITE CONDUIT... for exposed work and for installation underground without concrete encasement.

TRANSITE KORDUCT... for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.

An old
campaigner at
*speeding
production*



—AND A VETERAN SALES-BUILDER

AGAIN, as in World War I, P-A-X automatic interior telephones are helping to speed and simplify war production. By selling this fast, dependable interior communication equipment you're helping to increase vital production—and at the same time you're opening up new profit opportunities for yourself!

Many of your customers whose work is tied into the war effort can speed production—lower costs, by using P-A-X automatic telephones for interior communication. Give them *all* the facts. If you need help, call on the Automatic Electric representative nearest you. He will be glad to work with you.

These systems are designed for private service. They are not intended to be connected with the public telephone system.

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1033 W. Van Buren Street, Chicago, Ill.
Sales and Service Offices in Principal Cities

In Canada:
Canadian Telephones & Supplies, Ltd.,
Toronto, Ont.

In the News

[FROM PAGE 109]

- 337 Electrical metallic tubing—ferrous metal.
- 3371 Enameled—only for: (a) embedding in masonry or concrete. (b) Housing No. 4 conductors or larger, where exposed.
- 3372 Zinc coated optional only for: (a) Embedding in exterior masonry or concrete. (b) Housing No. 4 conductors or larger, where exposed on exterior of structure.
- 338 Rigid Conduit—ferrous metal.
- 3381 Enameled—optional for uses specified in 3371 above where during installation or afterwards it will be subject to severe mechanical injury.
- 3382 Zinc coated—optional for uses specified in 3372 above where during installation or afterwards it will be subject to severe mechanical injury.

Outlet Boxes

- 341 Non-metallic type.
- 342 Ferrous type, where connected to eligible metallic raceways or armored cable, enameled; zinc coated optional only for use specified in 3372 and 3382 above.

Plates and Wiring Devices, such as convenience and special purpose receptacles, switches and lampholders; non-metallic plates, non-metallic outer shells and covers for lampholders.

Fittings

- 361 Clamps, locknuts, connectors, bushings and nipples—zinc or cadmium coated.
- 362 Hangers, straps, supports, sleeves and fastenings—ferrous metal—no metallic coating.
- 363 Cable connectors—Copper and copper alloy for current-carrying parts only.

Solder

Lighting fixtures—Copper or copper alloy for current-carrying parts only; non-metallic shells and covers for sockets.

- 381 Interior—non-metallic type or light gauge ferrous sheets, spun, stamped



COMRADERY among competitors is enjoyed by Minnesota electrical contractors (L to R) Emil Wiese, Lakefield; E. R. Thorsness, Worthington; J. F. Buschena, Fulda and V. C. Zentz, Elmore. The boys all work in a small radius of each other, keeping the farmsteads electrically sound.

QUAD

**LIGHTING UNITS
ALL HAVE CORRECT
BASIC DESIGN**

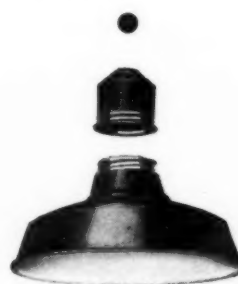
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**CONSTRUCTION
FEATURES**

QUAD



★ When you sell **QUAD** Lighting Units you sell products scientifically designed to give your customers the highest lighting efficiency. Full line of industrial and floodlighting equipment—incandescent — fluorescent — mercury vapor. It's the line that stays popular.



**NO. 1184-M
RLM THREADED
DOME REFLECTOR**

QUADRANGLE MFG. COMPANY

Mfgs. of Incandescent and Fluorescent Lighting Equipment
32 50: PEORIA ST. CHICAGO, ILL.

or drawn with non-metallic protective coating and non-metallic shades and reflectors.

382 Exterior—non-metallic or ferrous fixtures with non-metallic coating. (Metal posts for supporting fixtures are not allowed.)

Low Tension Communication Assemblies—such as bells and door lock releases—only for multi-family dwelling structures. Private telephones not allowed.

COMING MEETINGS

National Industrial Service Association—Annual Convention, Cincinnati, Ohio, May 4-6.

National Electrical Contractors Association—Annual Convention, Bigwin Inn, Lake of Bays, Ontario, Aug. 31-Sept. 5.

National Electrical Manufacturers Association—Spring Meeting, The Homestead, Hot Springs, Va., May 10-15.

National Electrical Wholesalers Association—Annual Convention, The Homestead, Hot Springs, Va., May 17-21.

International Association of Electrical Inspectors—Northwestern Section, Portland, Oregon, Sept. 14-16. Southwestern Section, Fresno, Cal., Sept. 21-23. Western Section, Book-Cadillac Hotel, Detroit, Mich., Oct. 5-7. Eastern Section, Boston, Mass., Oct. 12-14. Southern Section, Richmond, Va., Oct. 19-21.

Priorities

POWER CURTAILMENT ORDER ISSUED

A limitation order which can be used to conserve power in the Niagara Falls area was issued on Feb. 28 by WPB. The order provides for mandatory system integration, operation of industrial generating equipment, reductions in use by non-defense industries, reduction in demands of large industrial users and restrictions upon the connecting of new large industrial consumers.

The plan will be used only in the event of a power sabotage and for the duration of the shortage. Residential consumers are not affected.

NEW BUILDING FORM

Extension of preference ratings by building contractors will be facilitated by order, P-19-h, which will be used to assign ratings to construction projects in response to applications on forms PD-200 and PD-200A.




The new form of order will permit application by builders by endorsement on purchase orders containing the serial number. A similar form of endorsement may be used for extension of ratings to the builders' suppliers, except that before extending a rating a supplier must execute a special

Conserving VITAL MATERIALS and POWER



BY SELECTING CERTIFIED BALLASTS

Properly designed, constructed and tested Fluorescent Lamp Ballasts are a present day conservation must. Approved Ballasts save on war-valuable materials because they give longer service and also lengthen lamp life by delivering proper starting current and a constant power flow. Then too, Certified Ballasts will give maximum lighting efficiency with lowest power loss.

Save on essential lamp and ballast materials as well as valuable power. Insist that all Fluorescent Ballasts you install bear the three seals that stand for long performance— for Safety:  for Operating Standards:  for Quality. Designed for long lamp and ballast life, constructed on automatic equipment for accuracy and constantly tested for close tolerances, Chicago Transformer Certified Ballasts will give you Fluorescent Lighting at its best.



**CHICAGO TRANSFORMER
CORPORATION**
3501 WEST ADDISON STREET • CHICAGO

**I never saw
a Fitting go
into the Line
so EASY!**



**You change the box
without disturbing
conduit**

Only with a Kondu fitting can you loosen two nuts and lift the box right out of the line—without disturbing the conduit. Every Kondu box is a union in itself.

**Use a
Threaded or
Threadless Connection
to Thin-Wall or Thick-Wall conduit**

At ANY outlet of ANY Kondu fitting, you can make either a threaded or threadless connection—to thin-wall or thick-wall conduit. Just insert the suitable bushing . . . they are interchangeable.

Practically unbreakable, Kondu fittings are close to 100% re-usable. Rigid connection is vibration-proof. Roomy enough for all splices.

Write for the Kondu catalog.

**KONDU CORPORATION
Erie, Pa.**

KONDU



**The Threadless Fitting Line
of Unequalled Variety**



In the News

[FROM PAGE 111]

form of acceptance. Only one filing of the acceptance is necessary, after which the supplier may extend any rating assigned by Order P-19-h, regardless of serial number.

Reference to the Priorities Critical List has been eliminated from the order, but use of the assigned rating has been more strictly limited to materials which will be physically incorporated in the rated project.

Suppliers to whom rating are extended under the new order may accumulate the ratings up to a period of three months until they can place an order for a minimum commercial quantity of the rated material if they do not process it in any way, and subject to the same restrictions, suppliers may "basket" or accumulate ratings on orders from two or more contractors.

SEVEN BILLIONS FOR EXPANSION

The estimated cost of war industrial plant expansions approved through December 31, 1941, totaled \$7,366,000,000, the War Production Board recently announced.

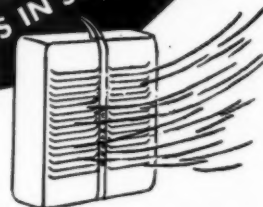
Commitments of public funds amounted to \$6,040,000,000, or 82 per cent of the total estimated cost. Of this, commitments by the United States government totaled \$5,885,000,000, and those of foreign governments amounted to \$155,000,000. The estimated cost of private expansion was \$1,326,000,000.

The following table presents in detail the estimated cost of war industrial expansions by type of product.



VENTILATION PROBLEMS occupy the time of Charles Schick (left), B & L Electric Co., electrical contractor, Brookfield, Ill., and H. Stai of the Autovent Fan and Blower Division of the Herman Nelson Corp., Chicago. Charley has been doing a bang-up job on home ventilation and believes it is important to the health and morale of every home owner.

THERMADOR
Fan-type Portable Heater
WARMs IN WINTER
COOLs IN SUMMER



ANSWERS INDUSTRIAL HEATING PROBLEMS

Watch efficiency and production soar when you install Thermador Portable Electric Heaters. Enclosed fan forces out comforting warmth or circulates refreshing, cooling air. Light, compact, portable, may be moved about plant or office with minimum of effort.

Equipped with four-position switch: cool, half heat, full heat, off. 8 feet of cord and polarity plug. 230 Volts—50 or 60 cycles A.C., Single Phase. Sizes to 5000 Watts. Write for prices and specifications.

THERMADOR

5119 SO. RIVERSIDE DRIVE, LOS ANGELES, CALIF.
230 MADISON STREET, OAKLAND, CALIFORNIA

**Everyone Can Use
this Handy OHMITE
Ohm's Law Calculator**



**Solves any Ohm's Law Problem
with one setting of the slide...**

SIMPLE—easy to use. Figures ohms, watts, amperes—quickly, accurately. Requires no slide rule knowledge. All values are direct reading. Scales on two sides cover the range of currents, resistances, wattages and voltages commonly used in electrical and radio work. Get this amazing (pocket-size) Calculator now!

Only

10c

To Cover Handling Cost **Send Coupon today!**

OHMITE MANUFACTURING CO.

4938 Flournoy St., Chicago, U. S. A.

10c in Coin enclosed. Send Ohm's Law Calculator.

Name

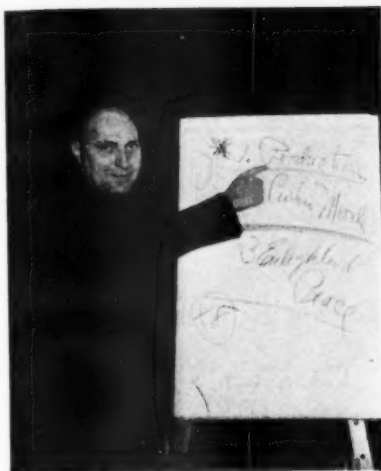
Address

City..... State.....

Elec. Cont. April 42

Be Right with OHMITE
RHEOSTATS • RESISTORS • TAP SWITCHES

Electrical Contracting, April 1942



POWER FOR DEFENSE production is highlighted by Irving L. Illing, illuminating engineer, Wisconsin Electric Power Co., in his talk on the power behind our line of defense, at the recent convention of the Wisconsin Electric Association.

Value of war industrial facilities financed through December 31, 1941.

	Estimated Cost in Thousands
Total	\$7,365,971
Aircraft, Aircraft Engines, Parts and Accessories	1,066,621
Ships, Construction and Repair- ing	858,518
Combat and Motorized Vehicles	175,073
Guns	414,238
Ammunition, Shells, Bombs, etc.	458,074
Explosives, Ammunition Assem- bling and Loading (Excl. Small Arms Ammunition)....	1,627,551
Iron and Steel Products	855,718
Non-Ferrous Metals and their Products	676,247
Machine Tools and Other Metal Working Equipment	95,127
Machinery, Electrical Equip- ment and Appliances.....	316,993
Chemicals	303,876
Petroleum and Coal Products..	63,149
Miscellaneous Manufacturing ..	132,703
Non-Manufacturing	322,083

NEW SUB-CONTRACT PLAN TO SPEED CONVERSION

To bring information about needed parts to firms seeking sub-contracts, a new directory of war work will be tried on a limited scale in the Chicago area according to an announcement by William H. Harrison, director of Production of the War Production Board. Speeding up sub-contracting activity will in turn expedite plans for converting existing plants.

In the test, selected prime contractors will list the work they have to be done, by separate parts, classifying each by the machine needed to make it, the tolerances required and the hours per week these machines have to work.

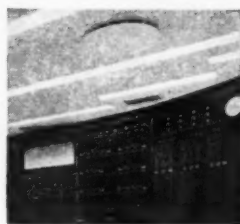
This information will be coded and arranged alphabetically so that prospective sub-contractors can readily find the jobs that will fit their idle machines.

INDUSTRY *for* DEFENSE

finds these SOLA transformers essential

for FLUORESCENT LIGHTS

Specified and used in many important air fields and defense plants, Sola fluorescent lamp ballasts guard against untimely failures and costly production delays. Their efficiency prevents excessive drain on already overloaded supply lines. Their small size permits use of compact fixtures, releasing excess vital materials for other use. Standard or constant voltage units available in single or 2-lamp capacities.



Ask for bulletin JFL-86

for MERCURY LAMPS

The uniformly high power factor (98%+) of Sola Mercury vapor lamp transformers imposes no wattless load on power systems. Completely independent of line voltage changes, they prevent lamp outage due to line voltage drops. They increase lamp life by insuring perfect lamp operation regardless of line voltage levels, and automatically protect supply circuits and fuses from disruption should lamp failure occur.



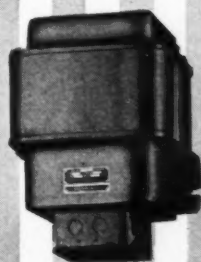
Ask for bulletin JMV-81

for POWER and CONTROL

It is far more economical to operate tools, power jigs and independent lighting circuits from higher voltage power lines. Where existing service lines are already loaded to maximum, their capacity can be increased by supplying them at higher voltages using Sola transformers to reduce the higher voltages to lower voltage levels. Air-cooled, double wound and auto types—.050 to 25 KVA—housing or encased types. Rugged heavy duty types specially designed for lighting and general power applications.

Ask for bulletin JPC-14

LISTED BY UNDERWRITERS LABORATORIES



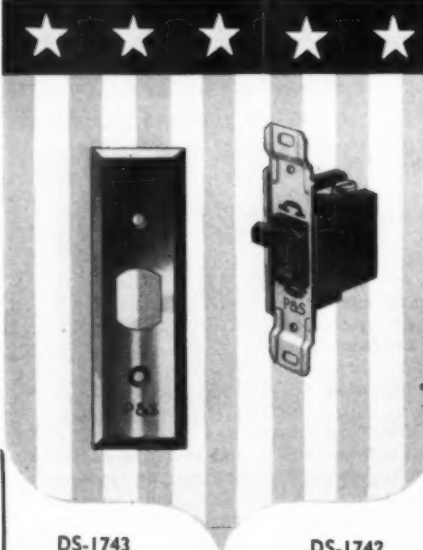
SOLA ELECTRIC COMPANY

TRANSFORMERS

P&S

WIRING DEVICES

**FOR
MARITIME
USE**



T-Rated Switches in S.P., D.P., 3-W and 4-W types—Brass plates with special Chrome finish, of a width and height for mounting in the narrow channels on shipboard.

Don't overlook P&S-Despard Devices for this type of work—Their small size makes them particularly adaptable for many shipboard installations.

**PROMPT SHIPMENT OF
RATED ORDERS**

**Sold Through
Electrical Wholesalers**

Send for your copy of our new catalog.

Pass & Seymour, Inc.
SYRACUSE, N. Y.

In the News

[FROM PAGE 113]

NEW WHOLESALE PREFERENCE FORM

Priority problems of electrical wholesalers and jobbers will be simplified by the use of a new application form which has been designed for the special use of distributors. New form is known as PD-1X, according to an announcement by WPB.

Insofar as materials and supplies can be made available without interfering with the war effort, priority assistance will be given to distributors and wholesalers who apply on the new form so that they can keep sufficient stocks on hand to maintain essential productive and service industries in operation.

In recent months, distributors have been hesitant to make deliveries to retailers and other important users who cannot furnish priority rating certificates, because the distributors were afraid that they would not be able to replace the material in their own inventories. Use of the new form will enable distributors to request preference ratings for essential supplies without receiving or extending a rating on every individual order which they fill.

Distributors who use Form PD-1X will be required to furnish information on their sales and inventory of the types of material for which priority assistance is requested. Ratings will be assigned on the basis of the importance of the product, the use to be made of it by the distributors' customers, and the availability of materials needed.

Distributors should also furnish information showing the percentage of material shipped out of stock on rated orders during the preceding month or second preceding month, as compared with total sales, if such information is available. The distributor should also give any pertinent information as to where he sells the products he distributes.

A uniform system for assignment of ratings will be developed in cooperation with the various industry and materials



FINANCIAL REPORT is checked over by R. J. Conklin, Watertown, Wis., treasurer of the Wisconsin Electrical Association, while E. H. Kunze, L & K Electrical Co., Milwaukee, looks on.

MINERALLAC HANGER



Conduit $\frac{3}{8}$ "— $2\frac{1}{2}$ "
Cable to $2\frac{1}{8}$ " (with Bushings)

**Cadmium and Everdur
MINERALLAC JIFFY CLIP**



Sizes from .250" O.D. Tubing
to $1\frac{1}{4}$ " conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

Monarch
*Your Best
Choice for—*

**RENEWABLE FUSES
"MON-O-LAG"**

Completely
Approved



**RUGGED
CONSTRUCTION
EASIER TO RENEW**

MAXIMUM PROTECTION

"THE MONARCH LINE SINCE 1909"
Monarch
FUSE COMPANY.
JAMESTOWN, NEW YORK



OTTO H. JOHNSON, president, *Electric Supply and Construction Company*, St. Paul, Minn., electrical contractors, checks over a set of electrical plans for a defense plant. He recently made an interesting 10,000 cycle generator installation for brazing shell cases, in a plant converted to war production.

branches concerned so that all distributors handling the same types of products for the same classes of customers will receive similar ratings.

Use of the new form is not expected to cover all of the distributors' requirements for priority assistance. When a distributor fills an order bearing a priority rating for a substantial quantity of material, he should extend the rating to his producer instead of applying for a new rating on Form PD-IX. The new form is intended rather to enable distributors to keep their inventories of parts and products sold in small quantities up to a practicable working minimum.

A new order known as L-63 limits the size of inventories which may be maintained by distributors and the quantities of items for which priority assistance will be granted on the basis of PD-IX applications subject to the terms of this order.

Distributors, wholesalers, and jobbers will be required to use the new forms exclusively in applying for priority assistance. When a rating or ratings are authorized in connection with a PD-IX application, they may be applied on distributors' orders to producers by a simple form of endorsement on the purchase order containing the serial number of the approved application. Ratings authorized for specified quantities of materials may be applied to more than one purchase order placed with different suppliers, provided that the total quantity to which the rating is assigned is not greater than the total amount authorized. Suppliers and producers to whom the rating is extended in this way may re-extend the rating to obtain materials which will be physically incorporated into materials or products to be ultimately delivered to the distributor in accordance with the terms of the certificate.

REFRIGERATION REPAIRS RECEIVE A-10

Priority assistance for the maintenance of refrigerating equipment in stores and restaurants has been granted under the terms of P-100. An amendment includes the maintenance of refrigerating equipment

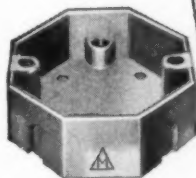
ILLINOIS

Completely Insulated

ALL PORCELAIN

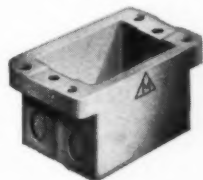
WIRING SYSTEMS

for
HOME, COMMERCIAL AND
INDUSTRIAL WIRING *Conserve*
STEEL, ZINC, COPPER, RUBBER



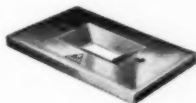
OUTLET BOXES

Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes and mounting screws. High mechanical and electrical efficiency.



SWITCH BOXES

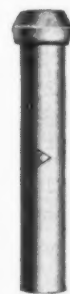
Insure greater safety in wiring and the elimination of all grounding hazards. Made of best quality white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plugs, outlets, etc. Knockouts for single wires, also for cables. Specify and use them.



● Not only because porcelain saves vital materials is it valuable today but because these systems give you highest standards in results and offer your customers permanent wiring. Porcelain systems are safe, easy to install, and adaptable to practically all wiring plans and layouts. Grounding is unnecessary. No rusting or corrosion. Install ILLINOIS All Porcelain Wiring Systems the next time you have a wiring job.

STANDARD TUBES

In sizes 1/2 to 48 inches, 5/16- to 3-inch diameter in following types: unglazed, glazed, split, floor, split floor, headless, curved end, cross-over split, and cross-over. Diameters all uniform both inside and outside.



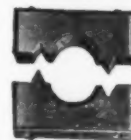
KNOBS

Cement coated — nail — genuine leather-washer — code standard. They don't chip when driven in and they stay in place.



TOGGLE SWITCH PLATE

All porcelain with beveled edge and decorative pattern or face.



CLEATS

Standard one, two, and three-wire types.



ILLINOIS ELECTRIC PORCELAIN CO.

MACOMB, ILLINOIS

Paragon TIMERS

SAVE MAN-POWER

Of course you want to save man power and greatly step up total production. And if you're skeptical about Paragon Timers being able to help you do it — *think a minute.* Aren't there operations in your plant involving timing — such as machine operation, light exposure, power disconnect, conveyor operation, et cetera? If so, Paragon Timers have a place. Investigate them . . . find out how these precision built, accurate and reliable instruments are saving man power in hundreds of manufacturing operations.



900 Series



*Write
for this
Book*

. . . describing
industrial timers,

time switches and other time controls. Contains illustrations, construction and installation data, list prices and reference information. To avoid delays, please furnish with your order for timers a preference rating of A-10 or better.

PARAGON ELECTRIC COMPANY
401 South Dearborn Street, Chicago, Illinois



[FROM PAGE 115]

in stores and restaurants among the uses for which the A-10 preference rating may be assigned.

WIRE PRICE SCHEDULE AMENDED

The OPA, on March 18, issued Amendment No. 1 to Revised Price Schedule No. 82 relating to electric wire and cable. The original schedule imposed as maximum prices, the prices which prevailed on October 15, 1941.

Effective March 17, 1942, the new amendment exempts prices of products sold under developmental contracts with the U. S. Government, simplifies manufacturers' reporting requirements, and improves control over prices of new and specially designed products.

The term "wire, cable and cable accessories" means, among other things, "any copper, copper-clad or copper alloy wire or assembly or wires used for conducting electricity", and includes "special purpose communication, control or signal wire and cable, and flexible cord and cord sets" as further defined in the schedule.

PRP TO REPLACE BLANKET P RATINGS

A specific requirement approach to the control and distribution of scarce materials will replace the use of blanket priority rating orders as rapidly as the necessary new orders and procedures can be put into effect, J. S. Knowlson, Director of Industry Operations, has announced. Between April 1 and June 30, most of the blanket rating orders will be revoked or allowed to expire, and companies which have been operating under blanket ratings will be required to



"HOW'S DELIVERIES?" asks O. T. Havey (left), Havey Electric Co., Madison, Wis. contractor, as he greets H. E. Mason, Appleton Electric Co., Milwaukee, at the annual convention of the Wisconsin Electrical Association.

Remodeling LOW-COST HOUSING

Install
VICTOR
In-Built
Ventilators

for
Healthful Living

A vital necessity in low-cost
Dry Wall Construction.

Write for latest catalog.

GET THE FACTS

VICTOR ELECTRIC PRODUCTS, INC.
Dept. IB-54,
2950 Robertson Ave., Cincinnati, Ohio



HERWIG

Manufacturers of
**OUTDOOR LIGHTING
FIXTURES**

for over 30 years

CAST IRON and BRONZE



The above illustration is one of
the many shown in our catalog.

**A FIXTURE FOR
EVERY OUTDOOR PURPOSE**

Herwig Fixtures Have Been Specified
by the U. S. Government and leading
architects for years.

**THEY ARE SUITABLE FOR ALL
CLASSES OF BUILDINGS**

Send for Complete Catalog

The HERWIG Company
1745 Sedgwick St.
CHICAGO ILLINOIS

apply for priority assistance under the new Production Requirements Plan.

Increasing materials requirements of the war program make it impractical to continue the use of preference ratings which have been assigned under existing "P" orders to whole industries, without any exact check of the amount of material which such ratings may be used to obtain. Through PRP the Director of Industry Operations will continue to assign ratings to deliveries of materials for essential uses, but the rating assigned in each case may be used to obtain only a specified quantity of materials.

Under PRP a company makes a single application for priority assistance covering all of its estimated materials needs over a three-month period. The applicant submits full information as to his inventories, the end use of his products, etc. Priority ratings are then assigned on the basis of such applications to permit producers of products essential to the war effort or minimum civilian needs to obtain specified quantities of materials during a quarter. Interim applications may be filed when a company needs additional quantities of material during the quarter because of increased war or other essential business.

A Modified Production Requirements Plan has been developed to meet the needs of small firms whose business is less than \$100,000 a year. Such companies may use a simplified application form, PD-25X.

The effect of placing virtually all of American industry, including producers who supply the Army and Navy, under the Production Requirements Plan will be to give WPB closer control of the distribution and use of all scarce materials. The most important raw materials, such as aluminum, copper, steel plates, etc. are already allocated at the producer's level. General use of PRP will provide control of the flow of these materials down to the level of end products.

Because it would be physically impossible to handle the load of PRP applications if they were to be submitted immediately from all companies in all industries, the changeover from the use of blanket ratings will be continuous over a period of three months, and each industry will be notified as to the date by which the change must be completed. A considerable number of "P" orders have already been amended to provide that after a specified date, the blanket ratings assigned by such orders will be revoked, and producers who have been using them will have to apply for priority assistance under PRP.

Processing of PRP applications will be handled in cooperation with the appropriate industry and materials branches of the War Production Board in such a way that all companies producing similar products for similar uses will receive uniform treatment.

New limitation or conservation orders will continue to be issued to curtail production by non-essential and less essential industries which still use scarce materials, and to force substitutions for scarce materials wherever possible in essential industries. All ratings assigned under PRP will be subject to such controls.

PRP is not a new and untried program. The plan was announced early in Decem-

Protect INDUSTRIAL MIGHT with a RING OF LIGHT FROM PERMAFLECTOR FLOODS

New



- RUGGED, WEATHER-PROOF CONSTRUCTION
- CORROSION-RESISTANT TREATMENT
- *PERMAFLECTOR ENGINEERED, CONTROLLED LIGHT
- FOUR WATTAGES; THREE LIGHT DISTRIBUTIONS—CLOSE, INTERMEDIATE AND LONG RANGE SERVICE
- LIGHT WEIGHT — EASIER HANDLING

*The silvered glass reflector with the permanent reflecting surface.

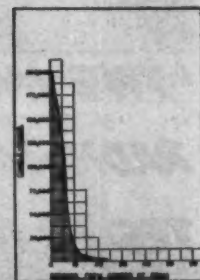
Minimum of Critical Materials Used

Combat sabotage and maintain production schedules with these new enclosed Permalector Steel Floodlights. These units are designed as illustrated above; are complete, ready to install; and consist of a spun steel case equipped with hinge and clamps, heat-resisting cover glass, cast iron base, wire cord grip fitting, three-foot length of rubber-sheathed duplex wire, mogul socket and a Permalector, the silver mirrored glass reflector which provides engineered light control from extreme concentration to extra broad spread. Completely weather-proof and corrosion-resistant, these floodlights are ideal for all outdoor floodlighting applications. They may be mounted on a vertical or horizontal surface or attached to a pipe and adjusted to almost any position. Avoid delay, send in your inquiry or order today and obtain prompt delivery.

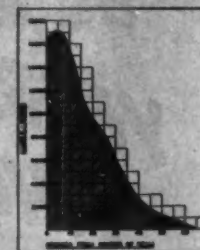
APPLICATIONS
Air Fields
Army Posts
Factories
Railroad Yards
Shipyards
Dams
Bridges
Reservoirs
Power Stations

Cat. No.	Cover Glass	Incandescent Lamp	Distribution
ST-1050	Stippled	500-300 watts	Broad
ST-1150	Stippled	500-300 watts	Narrow
ST-1010	Stippled	1000-750 watts	Broad
ST-1110	Stippled	1000-750 watts	Narrow
ST-1150-C	Clear	500-300 watts	Concentrated
ST-1110-C	Clear	1000-750 watts	Concentrated

Standard Quantity—1 Approx. Net Weight Each—35 lbs.



Concentrated Distribution Floodlights Nos. ST-1150-C, ST-1110-C. Addition of Stippled Cover Glass Provides Narrow Distribution.



Broad Distribution of Floodlights Nos. ST-1050, ST-1010.

PITTSBURGH REFLECTOR CO.

403 OLIVER BLDG
PITTSBURGH, PA.

PITTSBURGH REFLECTOR CO. EC-4-42
403 Oliver Building
Pittsburgh, Pa.

Please rush complete data on Permalector Enclosed Floodlights.

Name.....

Firm.....

Address.....



TUFFERNELL!

**—THAT'S
THE IMPROVED,
RADIO-FREQUENCY
TESTED INSULATION
THAT'S HELPED KEEP
WESTINGHOUSE
C.S. MOTORS
YEARS
AHEAD!**

J-21238



**SEE PAGE 2
AND PAGE 3**

In the News

[FROM PAGE 117]

ber, and a considerable number of companies have been operating under it since January 1. PRP itself grew out of the old Defense Supplied Rating Plan, which was first announced nearly a year ago.

The extension of PRP to cover a much broader field, and its substitution for "P" orders, will constitute another long step toward gearing the whole American economy into the war program. When the changeover is completed, priority assistance will be granted only for specified quantities of materials or products, and the War Production Board will then be in a position to go as far toward complete allocation as war needs may require.

The statistical information obtained as more and more companies operate under PRP will enable the Division of Industry Operations, in cooperation with the WPB Requirements Committee, to steadily improve the assignment of ratings and allocation of materials for various industries. In the meantime, a mechanism for controlling the distribution and use of all scarce materials will have been set up.

**—WITH THE—
Manufacturers**

Spero Appointments

The Spero Electric Corporation announces the opening of a New York office at 33 West 42d Street. This office will be manned by Earl H. Spero and Donald W. McIntosh. They will cover metropolitan New York and the surrounding territory.

Neil B. Walsh has been appointed a special factory representative to cover the entire country.

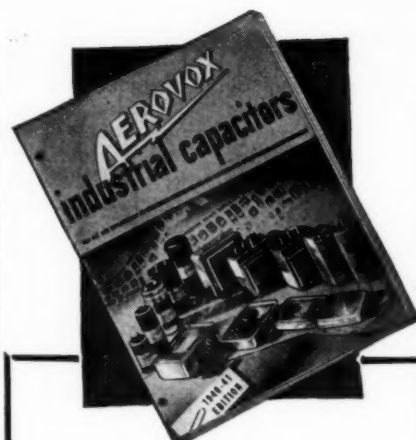
E. Vernon Murphy has been named to cover Baltimore and Washington, D. C. His headquarters are at 111 Cheapside St., Baltimore.

James T. Heagarty will cover Virginia and North Carolina, making Richmond his headquarters.

Allis-Chalmers Promotions

Edwin H. Brown has been elected a vice-president of the Allis-Chalmers Manufacturing Co., in charge of engineering and development. For seven years Mr. Brown was manager and chief engineer of the engine and condenser department.

Ralph R. Newquist has been named as assistant to Walter Geist, vice-president. C. W. Schweers succeeds Mr. Newquist as manager of the Houston office.



Just ask for Your Copy . . .

● **IT'S FREE**—this combined manual and catalog on motor capacitors. Just the practical data you need in servicing capacitor-start refrigerators—diagrams, charts, formulas, PLUS handy listings of all standard capacitor-start motors and their capacitor requirements. Handy cross-index of Aerovox capacitors and motor manufacturers' part numbers.

Or write us direct. Ask your Aerovox jobber for copy. Order capacitors from him.



MULTI FLUORESCENT REFLECTORS

FLUORAINE



FLUROLITE



● If your customers require fixtures of high lighting efficiency, for general or localized lighting, the MULTI line of fluorescents is complete enough to give you the unit best suited for the job. They are extremely flexible and meet the urgent need for expansion and change that 24-hour working shifts necessitate because of war production demands. Easy to install and service.

● Send for complete catalog.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

G-E Appointments

T. F. Barton of New York and W. B. Clayton of Dallas, Texas have been elected commercial vice presidents of the General



CLAYTON



BARTON

Electric Company. Both have been district managers in their respective territories and will continue as such.

Four new assistant comptrollers were also elected. They are A. B. Crouch, D. L. Millham and G. S. Hyatt of Schenectady and C. E. Anderson of Bridgeport.

Announcement has been made of the appointments of Harold M. Towne as manager of sales for lightning arresters and fuse cutouts and Max I. Alimansky as manager of sales for capacitors.

Graybar Electric Company, Inc. announces the appointment of W. E. Malli-cote as sales manager of the Chattanooga office. He was formerly a salesman at Knoxville branch. Mr. Malli-cote replaces C. C. McGraw who has been called into the service.

Progressive Welder Company, Detroit, announces the appointment of H. F. Merchant as sales and service representative in the Philadelphia area, including eastern Pennsylvania, New Jersey, Delaware and Maryland.

Hygrade Sylvania Corp., Salem, Mass. has named R. F. Hartenstein as a special representative. He was formerly director of lighting of the Ohio Edison Company, Akron.

Weltronic Corporation, Detroit, has appointed Walter Mochlenpah manager of the newly created Frostrade Division.

The Independent Pneumatic Tool Company has moved its Detroit branch to its own new building at 15605 Woodrow Wilson Avenue.

Roller-Smith Changes

In order to devote his entire time to his duties as chief engineer, J. D. Wood has resigned as president of the Roller-Smith Company.

The Board of Directors have elected Reg Halladay as the new president, and F. A. Judson as general manager.

**CONTROLS
FOR HEATED
FLYING SUITS**



The flyer turns the knob on the little Ward Leonard Rheostat and just the right degree of comforting heat surges through his flying suit. It is not an ordinary commercial control but one that has the ruggedness and dependability required by air service in spite of its minute dimensions and extremely light weight. This is but one of the many special control devices that Ward Leonard is producing in quantities to serve national defense.

WARD LEONARD

Electric control  devices since 1892.



WARD LEONARD ELECTRIC COMPANY, 28 South Street, Mount Vernon, New York



CONTROLLED Traffic
"SPEED with SAFETY"

This unusual traffic intersection was a knotty problem for the traffic engineer who had to control it with traffic signals. Simplex-ANHYDREX Underground Cables were specified and used because it would be difficult and expensive to get at the cables after installation and there had to be a minimum of traffic interruptions. With ANHYDREX the possibilities of corrosion, electrolysis, sheath currents and other troubles that frequently interfere with operation of metallic sheath cables could be ignored. Some of the cables are in conduits and others laid directly in the earth.

If you would like more information about Simplex-ANHYDREX Underground Cables we shall be pleased to send a descriptive booklet upon request.

SIMPLEX WIRE & CABLE COMPANY

79 Sidney Street, Cambridge, Massachusetts

Having trouble getting



A McGraw-Hill Service
330 West 42nd Street,
New York, N. Y.

ighting equipment?

The "Briefalogs" of these 42 manufacturers of lighting equipment are ready at your fingertips *for instant use!*



Adapti Co.	General Electric Supply Corp.	Overbagh & Ayres Mfg. Co.
Appleton Electric Co.	Globe Lighting Fixture Mfg. Co.	Philadelphia Electrical & Mfg. Co.
Austin Co., M. B.	Graybar Electric Co.	R-B-M Mfg. Co.
Bead Chain Mfg. Co.	Guth Co., Edwin F.	Revere Electric Mfg. Co.
Benjamin Electric Mfg. Co.	Herwig Co.	RLM Standards Institute, Inc.
Bright Light Reflector Co.	International Resistance Co.	Simplet Electric Co.
Chicago Transformer Corp.	Jefferson Electric Co.	Sola Electric Co.
Conduit Pipe Products Co.	Kees Mfg. Co., F. D.	Steel City Electric Co.
Cope, Inc., T. J.	Kent Metal Mfg. Co.	Thompson Electric Co.
Curtis Lighting, Inc.	Killark Electric Mfg. Co.	Westinghouse Electric & Mfg. Co.
Day-Brite Lighting, Inc.	Kwikon Co.	Westinghouse Electric Supply Co.
Dongan Electric Mfg. Co.	Lighting Products, Inc.	Wheeler Reflector Co.
Fischer Spring Co., Chas.	Lightolier	Wiremold Co.
General Electric Co.	McGill Mfg. Co.	Work-O-Lite Co.

If you're having difficulty finding sources of supply—want information on lighting equipment in a hurry—consult your copy of the 1942 Electrical Buyers Reference. It will save you time and trouble.

There's no need to search through a bunch of assorted catalogs of various manufacturers. The 42 manufacturers of lighting fixtures, parts, and supplies, listed on this page have given plenty of data

on their products in E.B.R.—everything you need to help you compare, select, specify and buy lighting equipment.

224 other manufacturers of electrical and allied equipment are telling their product story in the fact-filled pages of this reference. It pays to turn to Electrical Buyers Reference *first* for help in solving your purchasing problems.

YOU GET ALL THREE with a BLACKHAWK Pipe Bender



Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that can be used separately from the bending attachments. Here is the triple utility:

1 PIPE BENDING

Smooth, remotely controlled hydraulic power bends rigid conduit and pipe up to 4" diameter. Saves need for elbows and couplings and otherwise necessary cutting and threading.

2 MAINTENANCE AND PRODUCTION

Big range of attachments adapt the hydraulic unit to push, pull, bend, press, spread and clamp work. Pull gears and pulleys, lift machinery, (as shown at left)—do scores of other jobs allied to pipe bending.



3 SPECIAL JACK

Compact 10 or 20-ton ram (same as used in pipe bending) works in all directions — and at any angle. Preferred to all other types of jacks.

MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P2042, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

In the News

[FROM PAGE 119]

The Clyde W. Lint Company, 100 S. Jefferson St., Chicago, has taken over the national sale and distribution of Jiffy Line of tools manufactured by the Paul W. Koch & Co.

Announcement has been made of the change in name of the Claude Banks Company to the Kirlin Company, 3435 East Jefferson Avenue, Detroit, Michigan.

Claude Banks will continue as plant manager. Bob Sweeney has been appointed Michigan representative.

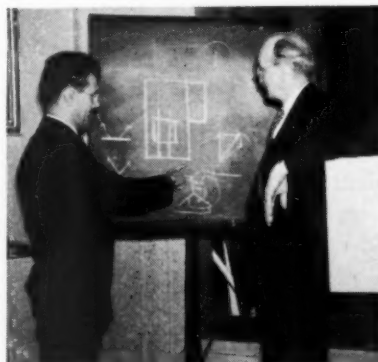
Irrington Varnish & Insulator Co., Irrington, N. J. announces the appointment of J. D. Van Valkenburgh as assistant to the president. He was formerly associated with the Johns-Manville Corp., New York.

More Gossip

Utah Inspector Retires

Blaine Grey, former chief electrical inspector of Salt Lake City, Utah and a former electrical contractor, is enjoying the pleasures of retirement. On Feb. 1, he retired from active service as chief inspector, a position he has held since 1934. Dick Wolters, succeeds him.

Mr. Grey was recently tended a testimonial by the Utah Chapter, IAEI which he organized. He was also a past-president of the Northwestern Section, IAEI.



MODERN DESIGN of transformers reduces maintenance requirements, G. W. Clothier, engineer in charge of transformer sales, Allis-Chalmers Mfg. Co., tells G. J. Palm, president, Chicago Electrical Maintenance Engineers. Mr. Clothier recently presented an illustrated talk on this subject before the local E.M.E. Group.

SEARCHLIGHT SECTION

(Classified Advertising)

Employment Business
Equipment

(Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATE

15 Cents a Word, Minimum Charge \$3.00. POSITIONS WANTED (full or part time salaried employment only), 1/2 the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements.

The advertising rate is \$7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 1/2" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by April 21st will appear in the May issue, subject to limitations of space available.

REPRESENTATIVES WANTED

for established

PANEL AND SWITCH LINE

We Can Deliver
the Goods

Here's an opportunity for good men! Represent a well-known concern manufacturing an established line of Safety Switches, Service Equipment, Panelboards, and allied equipment.

Our products have established a high standard of quality in their field. . . .

An opportunity for men with proven ability to produce.

RW-31, Electrical Contracting
330 West 42nd St., New York City

WANTED

Man capable of production winding of DC & AC generators up to 15 KW.

Kato Engineering Company
Mankato, Minnesota

Manufacturers of AC & DC generators, 350 through 15,000 watts, 2, 3 and 4 wire.

WE BUY AND SELL
MOTORS
TRANSFORMERS
MOTOR GEN. SETS
OIL SWITCHES
AIR CIRCUIT BREAKERS
ELECTRIC EQUIPMENT CO.
347 N. Clinton Ave., Rochester, N.Y. Tel: Main 252

Harkins Heads Milwaukee League

R. J. Harkins was elected president of the Electrical League of Milwaukee at its annual meeting. H. Q. Beven is vice-president; N. C. Christopherson, secretary; and T. H. Desmond, treasurer.

Members of the Board of Directors are Bruno Barg, H. Q. Beven, F. A. Coffin, Henry Czech, H. A. Droegkamp, R. J. Harkins, H. F. Ilgner, O. R. Nichols, H. J. Russell, W. H. Roth, P. Y. Tummy and Walter VanLare.



GLENN ROWELL, engineer of Fire Underwriters Inspection Bureau, Minneapolis, was recently re-elected secretary-treasurer of the Minnesota Electrical Inspectors Association.

A Big Job Ends

Kansas City's New Electrical Code is finished and ready for adoption by the city fathers. The administration portion of the new Electrical Section of the City Building Code was approved by the directors of the Electric Association of Kansas City, February 17. It took 30 committee meetings, spread out over a year, plus several industry analysis group meetings chaired by Fred Geiss, to iron out all the wrinkles. Code conference included representatives of the Real Estate Board, Building Owners and Managers and Power Engineers, as well as electrical men.

Minnesota Electrical Men Honored

Three members of Minnesota's electrical industry were honored, at the recent convention of the North Central Electrical Industries, for a half century of service in that area.

The Minnesota Electrical Association awarded Golden Jubilee Certificates to Lewis C. Topping, operating division, Northern States Power Co., Fargo, N. D.; Fred J. Frasier, electrical contractor, Minneapolis and John E. Haley, operating engineer, City Hall Court House, Minneapolis.

WHERE TO BUY

Equipment, Materials and Supplies for
Electrical Construction—Maintenance—Repairs

DRILLS CONCRETE—METAL—WOOD



WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1 1/2" dia.; metal to 3/8". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone ATtatin 9866

Electric Operators
For Any Overhead Type Door
DOORS AND OPERATORS INC.
See page 295
Elec. Buys Ref. TIFFIN, OHIO

TEST-O-LITE

Tests Everything Electrical
From 100 to 550 Volts
Indispensable to electricians.
Equipped with Neon light
which tells instantly where
trouble lies in electric circuits,
fuses, cut-outs, motors, radios,
electric appliances; indicates
hot or grounded wires; tells
A.C. from D.C.



Only TEST-O-LITE, original
Neon tester, has exclusive
patented safety features.
Far superior to clumsy test
bulb. Fountain pen size
with pocket clip. Useful in
homes also.

List \$1.50
at leading jobbers.

L. S. BRACH

MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.



TATTELITE Tells on 'em!

Tests Door Bells, Checks Operation of Relay Contacts, Picks out
burnt out fuses, Pocket size, 3 to 25-volt range. Tests air-conditioning
and heat controls. Checks telephone, auto, airplane and
wiring circuits. Finds blown fuses, etc., etc. Full "use"
directions with each Tattelite. Price each \$1.75. 90 to 500 volt
Pocket Type tester, only \$1.00. Ask for free catalog.



TESTS DOOR BELLS
CHECKS OPERATION OF RELAY CONTACTS
PICKS OUT BURNT OUT FUSES
LITTELFUSE INC. 4789 Ravenswood Ave., Chicago, Illinois



L. B. ALLEN CO. INC. 6753 Bryn Mawr Ave. Chicago, Illinois

ALLEN Soldering Paste

Fast working — corrosion free.
Assures secure electrical and
mechanical joints. Triples
strength of solder. Underwriters
approved listing. Send for free
samples.

Your inquiry

will have special value . . .

If you mention this magazine, when
writing advertisers. Naturally, the
publisher will appreciate it . . . but
more important, this proof of active
reader interest will influence the advertiser
to continue and enlarge this
valuable reader service.

ON THE JOB EVERY INSTANT

ZENITH MAGNETIC CONTACTOR

Especially developed for severest duty with large electric
flashers, and heavy surge of Type C lamps.
Electrically held. Hum reduced to
minimum. Used with Time switches,
flashers, bombardiers, many other
purposes. 30 to 400 amps. A.C. &
D.C. Get complete Catalog of Zenith
Automatic Equipment.



ZENITH ELECTRIC CO.
845 S. Wabash Ave., Chicago, Ill.

This WHERE TO BUY Section

supplements other advertising in this issue with these
additional announcements of products and services essential
to efficient and economical operation, maintenance
and service. Make a habit of checking this page, each
issue.

Departmental Staff, ELECTRICAL CONTRACTING

NOW... you can secure the mathematical background you need

for the solving of everyday
electrical and radio problems

Radiomen and electricians know that the language and the habit of mathematics are essential to them for real grasp of, and progress in their chosen field. They know that mathematics is a tool for them that they are helpless without.

Now out of the U. S. Navy Radio Materiel School at Anacostia Station comes a complete home-study textbook that is so thorough, so careful in its explanations, so detailed in its examples that any reader "who can perform arithmetical computations rapidly and accurately is capable of mastering the principles laid down in this text."

JUST OUT!



MATHEMATICS FOR ELECTRICIANS AND RADIOMEN

By NELSON M. COOKE
Chief Radio Electrician, U. S. Navy
Member, Institute of Radio Engineers
604 pages, 6 x 9, \$4.00

This book teaches you mathematics from elementary algebra through quadratic equations, logarithms, trigonometry, plane vectors and elementary vector algebra with direct applications to electrical and radio problems. It teaches you how to apply this mathematical knowledge in the solutions of radio and circuit problems. In other words, it gives you the grasp of mathematics you need and then shows you how to use your knowledge.

Keep these 3 points in mind

- gives you 600 illustrative problems worked out in detail;
- Gives over 3000 problems for practice, with answers so you can check your work;
- based on more than 8 years' experience teaching mathematics to U. S. Navy electricians and radio operators.

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., 330 W. 42nd St., New York

Send me Cooke's Mathematics for Electricians and Radiomen for 10 days' examination on approval. In 10 days I will send you \$4.00 plus few cents postage, or return book postpaid. (We pay postage if remittance accompanies order.)

Name

Address

City and State

Position

Company E. C. 4-42

More Gossip

New Inspector for Kansas City

Kansas City, Mo., has a new chief electrical inspector. He is W. L. Hutchison, former deputy inspector and a former Kansas City electrical contractor.

Mr. Hutchison succeeds G. V. Dameron who resigned to take a position with the Evans Electric Company of that city, electrical contractors who are doing a large amount of defense work for the government.

Mr. Dameron was appointed chief inspector to fill the vacancy left, not so long ago, by the resignation of Leo J. McCormick.



MAINTENANCE SPECIALISTS from Beaver Dam, Wisconsin are Leonard Opits (left) of Opits Electric Co., and O. W. Perschke, Perschke Electric Co. Both contractors are kept busy keeping the electrical system of Beaver Dam's industries in A-1 condition and are making good use of the maintenance and repair priorities order.

Study Abroad

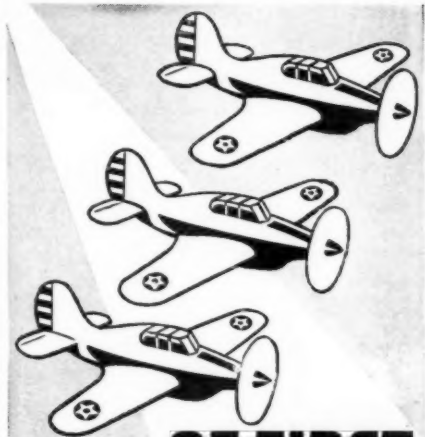
Hugh Weston, pride and joy of the Jerry Weston family in Kansas City, recently enjoyed an ocean voyage to Buenos Aires, where he enrolled at the University of Buenos Aires for a year's study under a scholarship grant.

Uncle Sam is footing the bill for the round trip boat ride, as part of our country's program for improved relations with South American countries.

Fiedler Heads Wisconsin Inspectors

Glen Fiedler, Green Bay, Wis., was elected chairman of the Wisconsin Chapter, IAEI, at a recent meeting of that group in Milwaukee. Unanimous ballots were also cast for A. W. Lipske, Menasha, vice-chairman; and John E. Wise, Madison, secretary-treasurer.

Executive Committee members are: E. C. Knight, Watertown; E. W. Vollbrecht, Sheboygan; A. B. Middlemas, Milwaukee; and E. L. Pagels, Whitefish Bay.



OF FIRST IMPORTANCE

Right now it's an all-out effort for Victory—but in the years ahead we shall make Signal products the ultimate in quality and price, as in the past 50 years. Quality is still our principal product.

SIGNAL ELECTRIC MFG. CO.

Menominee, Michigan

Offices in All Principal Cities



BADGER Synchronous ELECTRIC TIME SWITCHES



CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install
USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN

Pioneer Contractor Honored

Howard J. Jones, New Orleans, La., electrical contractor was recently presented a Golden Anniversary 50-year Certificate by the Electrical Association of New Orleans, in honor of 50 years of service to the electrical industry.

Howard started in the electrical industry with the old Edison Company but soon left to go into the contracting field, specializing in residential work. He has a record of being one of the longest continuously practicing electrical contractors in the city.

Others receiving similar recognition were Herman Blank, Edison Electric Illuminating Company, New Orleans; George B. Haygood, the Edison Co.; W. E. Fee, Louisiana Power & Light Co.; John S. Moore, New Orleans Sewerage and Water Board; Matt S. Marr, electrical division, New Orleans City Administration; Lyman C. Reed, former president, Electrical Association; Wm. Von Phul, president, Ford, Bacon and Davis, engineers, contractors and operators.



SHOP SUPERVISOR, F. L. Johnsen, *Boustead Electric & Mfg. Co., one of Minneapolis' largest electric motor repair establishments, is in the throes of remodeling and rearranging the repair department, while still helping to keep the industrial wheels turning. A specialized small motor department, for electric tools and such, is one goal. Mr. Johnsen is also secretary of the organization.*

Poor Plans

The Federal Housing Administration lists "incomplete wiring layouts which fail to give specific locations of all outlets" as one of the five major omissions on plans which delay applications for FHA mortgage insurance. The submission of badly drawn, incomplete or ill-conceived plans may easily be the cause of a loan rejection or a mortgage reduction, according to the report.

Almost 3-A-Day

Kansas City, Mo., started 1942 with a bang in the adequately wired home field. During January there were 87 Certified Red Seal, Adequately Wired Homes—three-a-day, if you throw out a couple of Sundays.

Alphabetical Index to Advertisers

	Page		Page
Acme Elec. & Mfg. Co.....	108	*McGill Mfg. Co.....	50
*Adam Elec. Co., Frank.....	99	McGraw-Hill Book Co.....	87, 124
*Aerovox Corp.	118	*Metropolitan Device Corp.....	1
*Allen Co., Inc., L. B.....	123	Miller Co.	49
*American Auto. Elec. Sales Co....	110	*Minerallac Elec. Co.....	114
*American Blower Corp.....	127	Monarch Fuse Co.....	114
Anaconda Wire & Cable Co.....	14	Multi Elec. Mfg. Co.....	118
*Appleton Electric Co.....	35	National Elec. Products Corp.....	72
Arrow-Hart & Hegeman Elec. Co....	6	*Ohmite Mfg. Co.....	112
*Austin Co., M. B.....	100	*Okonite Co.	7, 103
Automatic Elec. Mfg. Co.....	100	*O. Z. Elec'l Mfg. Co.....	106
*Beaver Pipe Tools, Inc.....	67	*Paine Co., The.....	70
*Benjamin Elec. Mfg. Co.....	41	*Paragon Elec. Co.....	116
Blackhawk Mfg. Co.....	122	Pass & Seymour, Inc.....	114
Brach Mfg. Corp., L. S.....	123	*Penn-Union Elec. Corp.....	108
*Briegel Method Tool Co.....	71	Pittsburgh Reflector Co.....	117
*Bright Light Reflector Co.....	54	Porcelain Group	39
Bryant Electric Co.....	105	Porcelain Products, Inc.....	39, 90
Bunting Brass & Bronze Co.....	67	Pyle-National Co.	92
*Burndy Engineering Co.....	97	Quadrangle Co.	110
*Century Electric Co.....	63	Radiant Lamp Co.....	96
Chase-Shawmut Co.	77	*Reliance Automatic Lighting Co..	124
*Chicago Transformer Corp.....	111	Republic Steel Corp.....	64, 65
Colt's Patent Fire Arms Mfg. Co..	91	*RLM Standards, Inst. Inc.....	75
Commercial Metal Products Co....	94	*Roebling's Sons Co., J. A.....	73
Crescent Ins. Wire & Cable Co....	34	*Sangamo Electric Co.....	55
*Curtis Lighting, Inc.....	51	Searchlight Section	122
*Cutler-Hammer, Inc.	27	Signal Electric Mfg. Co.....	124
*Day-Brite Lighting, Inc.....	45	Simplex Wire & Cable Co.....	119
Dolph Co., John C.....	126	*Sola Electric Co.....	113
*Doors & Operators, Inc.....	123	Spang Chalfant, Inc.....	5
Electric Equipment Co.....	122	Spero Electric Corp.....	46, 47
Employment	122	Square D Co.....	Inside Back Cover
*Fairbanks, Morse & Co.....	69	Steel & Tubes Division.....	64, 65
*Fibre Conduit Co.....	56	*Sticht Co., Inc., H. H.....	106
*Fleur-O-Lier Mfrs.	52, 53	*Superior Carbon Prod. Co.....	66
*Fullman Mfg. Co.....	36	*Thermador Elec'l Mfg. Co.....	112
*General Electric Co. (Bridgeport)		Thomas & Betts Co.....	43
Back Cover, 81, 84, 107		Trico Fuse Mfg. Co.....	72
*General Electric Co. (Nela Park) ..	37	*Trumbull Elec. Mfg. Co.....	85
*General Electric Co. (Schenectady)		U. S. Treasury Dept.....	95
Second Cover, 8, 9, 10, 11, 60, 61		Victor Elec. Products, Inc.....	116
Goodrich Electric Co.....	48	Wakefield Brass Co.....	79
*Graybar Electric Co.....	4, 16	*Ward Leonard Elec. Co.....	119
*Greenlee Tool Co.....	76	*Ware Brothers	86
*Guth Co., Edw. F.....	12	*West Dodd Lightning Cond. Corp..	80
*Hazard Ins. Wire Works Div.....	7, 103	*Westinghouse Elec. & Mfg. Co.	
*Herwig Co.	116	(Cleveland)	83
Hygrade-Sylvania Corp.	93	*Westinghouse Elec. & Mfg. Co.	
*Ideal Commutator Dresser Co....	101	(East Pittsburgh) ..	2, 3, 92, 100, 118
*Illinois Electric Porcelain Co....	39, 115	*Westinghouse Elec. & Mfg. Co.	
*Ilco Copper Tube & Products, Inc.	72	(Lamp Division).....	30, 31
Insto-Gas Corp.	106	*Westinghouse Elec. Supply Co....	89
*Johns-Manville Corp.....	109	*Wheeler Reflector Co.....	42
*Johnson Bronze Co.....	71	Where To Buy.....	123
Kato Eng. Co.....	122	Wodack Elec. Tool Corp.....	123
*Klein & Sons, Math.....	40	Youngstown Sheet & Tube Co....	33
Knox Porcelain Corp.....	39	Zenith Electric Co.....	123
Kondu Corp.	112		
*Lighting Products, Inc.....	86		
Littelfuse, Inc.	123		
Lloyd Products Co.....	78		

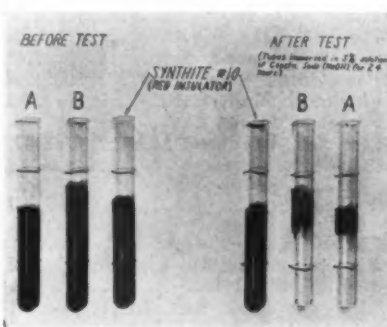


★ These companies have included Briefalogs, containing additional buying information on their products, in the 1942 edition of the Electrical Buyers' Reference.

You can protect motors against corrosives!

Rigid motor windings may be protected against the attack of acid and alkali by the application of a single coat of DOLPH'S SYNTHITE #10 Red Insulator. This air drying insulating enamel provides an extremely tough, bright red, glossy, oil and water-proof film which offers maximum resistance to the attack of corrosives.

Here's Proof



This laboratory test was run to determine the caustic resistance of SYNTHITE #10 Red Insulator and two other red oilproof enamels. One coat of each enamel tested was applied to a glass tube, all tubes baked and then immersed in a 3% caustic solution for 24 hours. Two enamels broke down completely—their film eaten away by caustic.

SYNTHITE #10 Red Insulator did not show any signs of deterioration but adhered tightly to the glass, retaining its high gloss.

Fast Drying—

Easy Application

SYNTHITE #10 is applied easily by brushing, spraying or dipping. Brush applications air dry hard in from six to eight hours. Recommended for inside or outside use as a protective coating for rigid motor windings, commutator end bars or for any application where a tough, high gloss, bright red finish is desired.

Write today for further information on this remarkable insulating enamel.

JOHN C. DOLPH COMPANY

168A Emmett St. Newark, N. J.

More Gossip

At Home Aboard

W. S. Johnson, Arrowhead Electric Co., Duluth, Minn., is doing a swell job in the shipyards of Duluth, both on and off the ships.

Bill started out wiring the shipyards and is now doing the electrical work on Uncle Sam's coast guard cutters and sub-chasers built at the yards. He spends so much time close to his work that he is equally at home on the ships or by his own fire-side.

Chicago Contractors Re-elect Officers

All present officers of the Electrical Contractors' Association of City of Chicago were re-elected at a recent meeting of that organization. They are: president, Wm. McGuineas and secretary-treasurer, J. W. Collins.

Members of the Executive Committee are: Wm. McGuineas, J. N. Pierce, J. M. Hoffman, A. C. McWilliams, F. S. Berry, Benj. Olsen and M. N. Blumenthal.

The Arbitration Committee is composed of Wm. McGuineas, J. N. Pierce, A. C. McWilliams, J. M. Hoffman and M. N. Blumenthal. Benjamin Olsen is the alternate.



BOOM TOWNS surrounding war industries in Indiana were ripe for disastrous electrical fires until Chief Inspector Pat Hyland of the Indiana State Fire Marshall's office sent in special crews of electrical inspectors. They co-operate with local contractors to check the hazards of lamp cord wiring in homes and overloaded systems in crowded commercial buildings.

Navy Calls Drumm

S. L. Drumm recently resigned as vice-president of the Electrical Association of New Orleans, to answer his country's call to active Naval duty. E. N. Avenog was unanimously chosen to succeed him.

Lieutenant Drumm has been assigned to Tulane University Naval Reserve Officers Training Corps, as an associate professor of naval science and tactics.



BOYS FROM BELOIT come up to Milwaukee to find out the fate of the smaller electrical contractor during the duration. A portion of the delegation includes (L to R) G. M. Greer, Duenow Electric Co., E. C. Melaas, W. P. & L. Co., G. W. Timm, G. W. Timm Electric Co., Lou Carroll, Carroll Electric Co., and Oscar Sobel, A. Sobel & Son. All hail from Beloit, Wis.

Famous Battles

SINKING OF THE JAP BATTLESHIP "HARUNA"—The heroism of Captain Colin Kelly will live long in history. Such self-sacrifice and bravery make America proud, spur others on to emulate his feat. To the men at the front, all glory and honor! It's their due. The men serving on the "production front"—who build the "tools" so vital to Victory—are doing an all-important job, too. Getting this vital equipment where it is most urgently needed places an added responsibility on distributors and dealers. American Blower Distributors and Dealers are doing all in their power to speed deliveries, place fans, blowers, ventilators and heaters where they are needed most, furnish prompt, dependable service to keep the nation's war industries producing. You can count on their cooperation during this emergency.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN Radiator and "Standard" Sanitary Corporation



More Gossip

Morris, Lindberg Head Twin-City Contractors

The electrical contractors of Minneapolis and St. Paul, Minnesota's twin-cities, recently announced the officers and directors of their respective groups for 1942.

The Minnesota Electrical Contractor Association elected John Morris president; C. S. Williams, vice-president and H. J. Mester, secretary-treasurer. Members of the Board of Directors are: Art Ingebredtson, Arthur Starbird, F. M. Tripp and A. L. Glatty. Because of the resignation of George Plank as business manager, the routine business of this association will now be handled by the office of the Minnesota Electrical Council.

The St. Paul Electrical Contractors, at their annual meeting, chose Wm. F. Lindberg as president; Herb Westman, vice-president; and August E. Hansen, secretary-treasurer. Directors of the association are Otto Johnson, Fred Page, F. W. Hoeft and C. A. Yares.

New Officers

At a recent meeting of the Central Jersey Electrical League, Trenton, N. J. the following officers were elected: president, Charles F. Burkert, electrical contractor; vice-president, Stephen A. Szabo, of General Motors; secretary, B. J. Kopp, of Public Service and treasurer, Jerry A. Madden of Tab Electrical.

Messrs. Burkert and Madden together with Robert I. Kulp, of the Hurley Tobin Company, were elected delegates to the New Jersey Council of Electrical Leagues.



CAPTIVATING SMILE belongs to Allen E. Wolf, Waseca, Minn., newly elected president of the Minnesota Electrical Inspectors Association. Allen covers REA territory in Minnesota, seeing to it that farmers have safe wiring.

Contractors Pool Equipment

Forty-four electrical contractors in Greater Vancouver, through the Vancouver Electrical Association, have placed all their tools, ladders, trucks, cars and other equipment at the service of the authorities for use as desired in any war emergency.

The offer was made to the Civic Fire and Police Committee and was accepted with much commendation and appreciation.

Business Brings Expansion

Johnny Johnson's motor repair shop in Staunton, Va., reports business has been on the upgrade—so much, in fact, that an "L" addition giving 500 sq. ft. of much needed floor space has been built on to the shop. This new space will house the small motor department.

Under one corner of the new building is a junk copper storage space, with a trap door in the floor and a door opening into an alley for loading. No scrap will be lost in this shop.



ELECTRICAL ADEQUACY is assured in this remodeled home as B. L. McClain (left) of Horton Electric Co., electrical contractors of LaGrange, Ill., goes over the plans with architect Harford Field of Hinsdale, Ill. Door switches, three-way switches and additional outlets are being added to the original plans.

Civic Record

A new record of public service was recently hung up by Fred J. Hume, president of Hume and Rumble, electrical contractors of New Westminster, Vancouver, Edmonton and other cities in British Columbia. Mr. Hume was elected to his ninth successive term as Mayor of New Westminster, B. C.

Denver Gets Apprentice School

Denver, Colorado, has started a government sponsored apprentice school for electricians. Victor C. Moulton, electrical inspector, Mountain States Inspection Bureau, Denver, and secretary-treasurer of the Rocky Mountain Chapter IAEI, will spend some time with the class in studying and discussing the National Electrical Code.



APPRENTICESHIP TRAINING is vitally important now, for present and post-war needs of electrical contractors, believe Silas Y. Moote (left) and Edward C. Madsen, Milwaukee field representatives of the Apprenticeship Division, U. S. Department of Labor.

Bagwell Gets Houston Post

L. R. Bagwell, graduate electrical engineer, member of the AIEE and the IAEI, was recently appointed chief electrical inspector of Houston, Texas. Mr. Bagwell was formerly connected with the Mutual Electric Company.

Toledo Contractors Pick '42 Slate

W. N. Brown was chosen president of the Toledo Electrical Contractors Association, Inc., Toledo, Ohio, at a recent meeting of that group. A. L. Bentley is vice-president and C. F. Hammer, secretary-treasurer.

Members on the Board of Governors, Toledo Building Congress, include Max Romanoff, Labor Relations Committee; A. L. Bentley, Legislative Committee; W. N. Brown, Publicity Committee; H. C. Scannell, Trade Practice Committee.

The Board of Trustees of the contractor's association is composed of W. N. Brown, A. L. Bentley, R. H. Winters, A. F. Pree-ter, G. L. Saunders, Max Romanoff, H. C. Scannell and C. F. Hammer, secretary.

Members serving on the various committees are: labor-agreement—H. C. Scannell, A. L. Bentley, O. H. Taylor, Max Romanoff, R. H. Winters; joint conference—H. C. Scannell, A. L. Bentley, C. F. Hammer; apprentice training—M. Dorn, Max Romanoff, G. L. Saunders; adequate wiring—R. Hammer, W. Eggleston, P. I. Patchen; electrical code—O. H. Taylor, W. McKie, G. L. Saunders; finance—Max Romanoff, W. N. Brown, C. F. Hammer; membership—E. DeLisle, R. Ayling and J. A. Overmeyer.

C. F. Hammer, as secretary, is also delegate to local, state and national industry meetings and conventions.

**SEE PAGE 125 FOR
ADVERTISERS' INDEX**

MOLINE HOUSING AUTHORITY
 SPRING BROOK COURTS
 PROJECT NUMBER ILL-20-1
 41ST STREET AND 12TH AVENUE
 PHONE Moline 1466
 MOLINE, ILLINOIS

SUBJECT:
 WE REFER TO FILE NUMBER
 January 8, 1942

Square D Company,
 806 Fifth Avenue Building,
 Moline, Illinois

Gentlemen:
 Just a line to tell you of the experience that we have had with Square D Multi-breakers, which were used in lieu of fuses in our U.S.H.A. aided, 184 dwelling unit project known as Spring Brook Courts.

At the time that this system was installed we were, of course, somewhat dubious due to the fact that we had never had any experience with this type of system, but at this point, after several months of operation we are very willing to tell you that we are extremely well pleased with its operation.

One of the main advantages that we find is the simplicity with which our maintenance crew is able to correct current failures. The time consumed in this operation is considerably less than would be the case with the old-fashioned fuses, and the compactness of the entire panel set-up is a very distinct advantage.

We are sure that anyone having a purpose comparable to ours will find the Square D Multi-breaker a distinct improvement over the old system.

Very truly yours,

Warren C. Skinner
 Executive Director,
 MOLINE HOUSING AUTHORITY.

WCS:lw



SQUARE D MULTI-BREAKERS ARE A "NATURAL" FOR HOUSING PROJECTS

The same advantages which have prompted scores of electrical contractors to use Multi-breakers in wiring individual homes, are just as much in evidence in multiple house planning.

Whether it's a small, individual unit for a cottage or a panelboard grouping of many units, the Multi-breaker's function is the same. It eliminates fuses completely. It affords truly modern convenience and protection. Its cost is about the same as for the switch and fuse equipment it replaces—often actually less.

If you aren't thoroughly familiar with the complete Multi-breaker story, write for Bulletin CA-4000.

MULTI-BREAKERS ARE NON-TAMPERABLE

SQUARE D COMPANY

DETROIT-MILWAUKEE-LOS ANGELES
 KOLLMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK
 IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

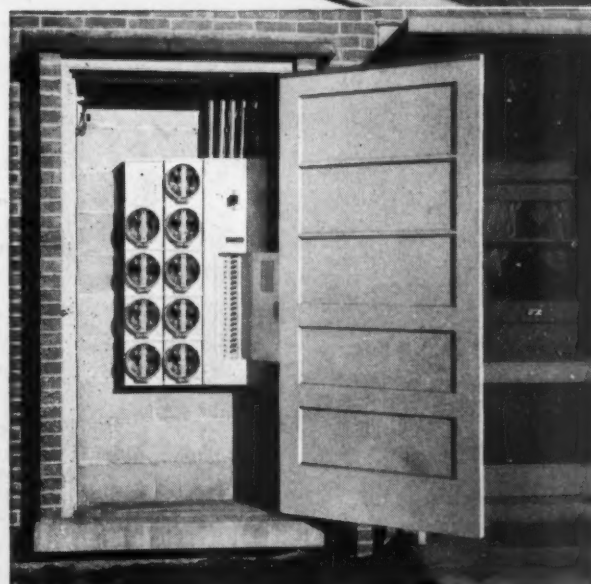


Illustration shows typical distribution panel, with Multi-breaker circuit protection, mounted adjacent to meter socket troughs having circuit closing devices for check metering. Similar installations call for individual Multi-breaker load centers used with meter trough.

CALL IN A SQUARE D MAN

Right Across the Country

G-E Wiring Materials Distributors Want to Co-operate In Aiding U.S. War Efforts

Conduit, wire, cable, wiring devices... all the materials you need to wire war production factories, war worker housing, cantonments . . . can be supplied by G-E Wiring Materials Distributors. One of them is located right in your own territory. Prompt service is the watch word.

Ask a representative of your G-E Wiring Materials Distributor for help in selecting materials . . . for new war factories . . . for conversion of plants to war production . . . for modernizing and maintenance. He'll be glad to help too in planning alarm systems, communication systems and lighting and light control systems for plant protection jobs you are handling.

Back of G-E Wiring Materials Distributors with their wide variety of materials and services stands the General Electric Company. Research keeps G-E materials up-to-date. Careful manufacture and first grade raw materials keep quality high.

G-E WIRING MATERIALS

See the nearest G-E Wiring Materials Distributor about G-E conduit, wire and cable, and wiring devices for your special requirements. Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.



Garrett, Miller Co. bowling team, 1941 champions of the Industrial League of Wilmington, Del. Team members use same concentration of effort in bowling as in serving customers. Men, left to right—C. S. Glover, W. L. Boyden, C. D. Crawford, W. H. Locke, R. L. Hollowell, Jr.



T. A. Brown (left), owner and J. A. Madden, purchasing agent, Tab Electric Supply Co., Inc., Trenton, N. J., are here discussing a plan for increasing their service to war industry customers by having their salesmen carry samples of wiring materials that can be depended upon for uninterrupted power distribution.



Every morning, G. E. Williams, salesman, General Electric Supply Corporation, Philadelphia, loads his brief case carefully for the day because by doing it, he saves time later and can give war production customers information about materials and deliveries quickly.



R. W. Cella (left), salesman, General Electric Supply Corporation, St. Louis, Mo., helped W. C. Burton "take off" materials needed from plans. Mr. Cella also aided in obtaining government approval for the materials and actively followed delivery schedules.

GENERAL  ELECTRIC

